THE CAUSAL RELATIONSHIP BETWEEN FUTURE AND SPOT MARKET: AN EVIDENCE FROM PAKISTANI STOCK MARKET

Pakistan Institute of Development Economics

By

Muhammad Nasir

PIDE2019FMDHILEAF03

Supervisor

Dr Ahmad Fraz

MPHIL Economics and Finance

PIDE SCHOOL OF ECONOMICS

Pakistan Institute of Development Economics,

Islamabad

Year 2022

Pakistan Institute of Development Economics
P.O. Box 1091, Islamabad, Pakistan

CERTIFICATE

This is to certify that this thesis entitled: **"The Causal Relationship Between Future and Spot Market: An Evidence from Pakistani Stock Market".** submitted by **Mr. Muhammad Nasir** is accepted in its present form by the School of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Economics and Finance.

Supervisor: Dr. Ahmed Fraz Signature: _____

Internal Examiner: Dr. Farhat Mahmood Signature: _____

External Examiner: Dr. Arshad Hassan Signature: _____

Head,
PIDE School of Economics: Dr. Shujaat Farooq Signature: _____

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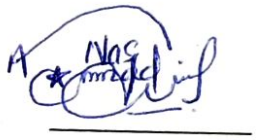
Signature of Student 

Name of Student Muhammad Nasir

This Paper is dedicated to my parents, brothers, sisters
and teachers from grade first to till now

ACKNOWLEDGEMENTS

I am thankful to my ALLAH who is the greatest of great, merciful, and kind. After ALLAH I am thankful to Prophet (PBUH), who taught us the right way and to differentiate between right and wrong. All that I have done is only because of the knowledge, power, patience that Allah has given me to complete this.

I am very thankful to Dr Ahmad Fraz who has not only great personality but also have a heart made of gold. He is great teacher, a great mentor, great supervisor, and a great man. His knowledge has not only help me in completing thesis but also made me to have influence in my personal life and personality building.

I am very thankful to my parents whose prayers gives me strength to stand stiff in front of very hurdle. I am also thankful to my brothers as they are like pillars to me, and I am thankful to my sisters for their prayers.

I am also thankful to my friends Adnan Saqib, Syed Wasim Abbas, and Vardah Sabir who made my days joyful, fun, adventurous and loving while staying in this institute.

I am thankful to all my well-wishers.

ABSTRACT

This study is carried out to check the causality between the returns spot prices and returns its future prices of companies listed in Pakistan Stock Exchanged. The study has used the daily time series data of twenty-five companies for 19 years. For analysis of data, different test has been applied to investigate the causal relationship. Descriptive statistics is used to check mean, minimum, maximum values of data. The ADF test is used for stationarity. Its result concludes that there is no problem of stationarity in data. Johansen cointegration test is used to check the relationship between data and Granger Causality has been used to check the causality between returns of spot and its future prices. The analysis suggests that cointegration exist between spot and future prices in all companies. Furthermore, the results also concludes that there is one way causality from SR to FR for eighteen companies and one way causality from future returns to spot returns for 3 companies and two-way causality for 4 companies. Variance decomposition suggest that most of its shocks are explained by its own. The findings of this study are important for investor in stock market who invest in spot and future market. As this study confer causality between spot and future so investor can take more informed and valid decision by giving them more knowledge.

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CHAPTER 1

INTRODUCTION

1. Introduction:

The concept of forward contract can be traced from 1700 BC, when a boy makes a contract of seven years of labor in New York to get marry to a girl. Some financial analyst called it as forward contract, and some called it an option market. (Haque, 1997). From that time till 1636, DM[1] (Derivative Market) exists in different shapes until 1637 in which first modern use of derivative occur in shape of forward agreement. Mishkin (2005) stated that the DM is a new form of Financial Instrument (FI) which came into existing in 1970s. Before that there was no necessity for DM because of the low risks involve in investments. After 1970s, the Derivatives became the part of many financial markets. The exchange rate crash in Bretton Wood System in 1971 brings more attraction to DM for hedging purpose (Rahman & Das, 2015). In Pakistan, DM started in 2003 (Jameel, 2008). Pakistan Stock Exchange (PSX) provide future trading in Cash Settled Future, Future Index, Index Options and Equity Deliverable Futures while Pakistan Mercantile Exchange provide future contracts Commodities Markets (Sayani, 2017).Single Stock Future (SSF) is agreement of two investors in which one should pay a price for a specific number of shares of SSF for a future fixed date and the seller will be held responsible to provide shares on a predetermined price in a future date (Drinkard, 2019). Stock Index Futures Contract (SIFC) is a formal contract in which we can buy and sell future stock index. Currently, KSE-30 has 30 stocks named as KSE-30 Index, providing an opportunity to invest in whole stock index instead of searching and buying individual stock futures (Derivative, 2020)

The introduction of Single Stock Future (SSF) is now a concerning issue for researcher that how much is it existing practically. How much volatility in prices at one market can affect the prices at another market? Conferring to the efficient market hypothesis (EMH), the prices of different securities must reflect all the available information (Fama, 1970). But in practical, there are also other factors like information travelling cost, dissemination cost, transaction cost etc.

1 A derivative market (DM) is defined by Hull (1989) that it is instrument of finance in which values are derived from other values.

which restrict to deliver information efficiently. These restrictions produce a lead lag relationship between the future trading and spot trading. This advantage of future market attracts more informed investors and make future to react before spot market, whenever new wide information enters to market, trading in spot prices can provide information for trading in future and vice versa (Strong, 2005). If the added information is reflected in both markets immediately then there will be positive contemporaneous co-movement between market prices. If the information is not reflected immediately, then lead lag relationship will be caused. The future market will lead because of their advantages for it will attract more informed investors. The spot market can lead probably because of the less noise trading[2]. And a bidirectional relationship can also exist in both spot and future market.

1.1 History of Derivatives and SSF in Pakistan:

The over the counter (OTC) trading started early in 2000 under SBP (State Bank of Pakistan). But on that time limited information was available for this kind of transaction (Sayani, 2017). By the introduction of SSF (Single Stock Future) in July 2001, many stakeholder took concerns about its influnce on market as There was a increase in the volume of future trading gradually. This increase led to 40% to 50% volume share of SSF in over all market. In Pakistan, two kind of derivative exist i.e equity based and Commodities based. Equity based trading started early in 2002 but commodity based started in may 2007 on PMEX (Pakistan Mercantile Exchnage).

Discussing the frequency of future contract in Pakistan, three contracts can be observed with difference in maturity. PSX facilitates its investor to invest in 30 days maturity, 60 days maturity contracts as well as 90 days maturity. RTD (Real Time Data) of these contracts can be seen on PSX website.

1.2 Theoretical background:

Efficient Market Hypothesis (EMH) is a much-debated topic in modern finance. Modern Finance believe that the markets is fully efficient. By the word efficient, they refer to the

[2] Noise trading refers to trading in which a trade occurs on certain factor which is believed to be true but in reality, does not earn any good return than random returns.

connection between stock prices and information related to stocks. Whenever the information relevant to stocks enter the market, the stocks adjust on time. So, in this way no investor gets abnormal benefits. EMH theory a market is said to be efficient if the information available fully reflect the prices of stocks set by information (Fama, 1970). It was believed that stock market is extremely efficient in information reflection about stocks individually as well as a whole. As added information enters in market, it spread quickly and incorporated in securities prices without any delay. Malkiel (2003) expressed EMH as random walk. The reasoning behind expressing EMH as random walk is that the flow of information has never been fast as it is now a days and if information is reflected directly in prices of stocks, then today prices of stock will only be reflected by today news and tomorrow news will affect tomorrow stock prices. As news are difficult to be predicted and sometimes unpredictable as random, the rate of return earns by experts and uninformed investors are almost same.

Fama in his study explains market efficiency in three categories as weak form, semi strong form, and strong form. In a weak form, the market prices will only be reflected by information available in past prices. In this form future prices cannot be forecasted, and no abnormal return can be earned be investor. In a semi strong form of market efficiency, the current market prices reflect all information available in public that is money supply, interest rate etc. Also, in this form it is not possible for trader to earn any abnormal returns as no abnormal return can be earn by just annual reports of companies and other published reports. In a Strong form of market efficiency, the current prices are reflected by all information that is public and private. This confidential information can lead to earn an abnormal profit. But it is debated that this confidential information is hard to find, so in reality this form of market efficiency does not hold (Truong, 2006).

Fama (1991) reconsidered the progress from 1970 – 1990 after the development from SLB (Sharp Linter Black) model (Sharpe, 1964; Lintner, 1965 and Black, 1972) and its criticism. His new study stated that available information reflects prices to the point when marginal benefit of information does not surpass marginal cost.

Schnabel (2010) studied the cost and carry model which explains the phenomena of future and spot prices. This model provides a connecting link between these two markets. Future prices contain an annual rate with discrete time and a cost for storage and at the end yield that will be generated by the commodity.

1.3 Research Gap:

Finding the volatility of future markets and spot markets has always been an issue and also to find their causal relationship. Some Researchers think that there is a causal relationship in spot market and future markets in which some claims it be unidirectional and some claim it be bidirectional phenomena. Some researchers have completely different results by finding no causal relationship between spot and future markets meaning that there is no causal relationship between these two markets. In Pakistan, some studies find the role of future market in price discovery and volatility (Khan & Hijazi, 2009). Some has tried to find the role of FM (future markets) in increasing the trade volume (Awan & Shah, Spring 2014). In Pakistan, these relationships have only been found in SSFs. The gap that we have found in these studies is that none of it has found causality between them that whether it is a unidirectional phenomenon or bidirectional phenomena or neither of it.

1.4 Problem Statement:

The introduction of future market has increased the volatility in spot market. The information flow in the future market is not only fast but also the cost is less. The low cost of transaction attracts investor more readily toward future contracts. As it is claimed that the future market can be a reason in increasing volatility in spot market which means that there exists causal relationship, so there is a need of study to investigate the causality of future trading in the spot market. There are very less studies in this area related to Pakistan, So, this study will provide a better picture of causality between spot and future.

1.5 Research Question:

Does there any long run and short run relationship between SR and FR. What is their speed of adjustment. Does there exist a lead-lag relationship between spot prices and future prices in stocks of PSX?

1.6 Objectives:

The objective is given below

- To find the long run relationship between SR and FR
- To find the short run relationship between SP and FR
- To find their speed of Adjustment through VECM
- To find the causality between the SR and FR

1.7 Significance of Study:

Looking at the increasing rate of use of future market at global level, financial scholars are eager to discover the relationship between the spot market and future market and its impact on SM (Spot Market) after the introduction of Future Market. Derivative Market helps investor to choose wisely before investment (Maverick, 2020). While the absence of Derivative Market means that Spot Market is purely dependent on the supply and demand of stocks (Desk, 2007) and so the presence of DM helps in price discovery, hedging, benefits of arbitrage. To take the full benefits from future contracts, ones must fully understand the relationship and volatility between future and spot market and above all the lead and lag relationship between Future Market and Spot Market (Zhou, 2016).

In Pakistan, SSF has gotten very less intention in terms of research. The significance of this study is to explore the cointegration between the spot prices and future prices of companies. Also, this study has provided a picture of lead lag relationship between spot return and future returns. This study has also provided insight for investor to minimize risk associate with investment and has provide information about risk diversification using SSF.

1.8 Organization of study:

This study is organized as; chapter 1 involves the Introduction in brief containing a little view of background from history, the chapter 2 contains Literature Review with concluding remarks, the chapter 3 contains Methodology which involve selection and sources of data and explanation about econometric techniques, chapter 4 contains empirical analysis in detail, chapter 5 contains results, conclusion, and limitation.

CHAPTER 2
LITERATURE REVIEW

2. Literature Review:

The past studies results are divided into three main categories. Some researchers found that there is no volatility between prices and no causality between them. While some researchers have claimed to have volatility between the markets. But these researchers are furthered divided into two: some have found unidirectional, and some have found bidirectional causality.

Researchers have study future trading in stock market to find its effect on spot market. The results vary from one country stock exchange to other country stock exchange. The results are also varied from sector to sector in the same stock market. Zhou et al. (2014) examined volatility between the spot market and future market in the context of china market. They collect highly frequency one-minute data having time period of august 23, 2010 to 21st June 2013 with a trading day of 681 in total, from Chinese CSI-300 Index. The paper concluded that there is a bidirectional relationship between spot and future market meaning that the information effect can be seen simultaneously in both markets. The volatility in future market can influence to fluctuates the prices in spot market and vice versa. They also find that the introduction of future market works as risk management because the variation in future market volatility can decrease the variation in spot market volatility. The paper has also invented the dynamic between the market by using Time Varying Parameter Vector Autoregressive and the findings were, as the time passes, the influence of future market on spot market increases.

MIN & Najand (1999) studied lead lag relationship between the future stock index and spot market in Korea market. for this study, 10 minutes intraday data sample is selected of a time period from 1996, 3rd May, to 1996, 16th October for KOSPI-200 making it a total of 2715 intraday observations. The return series is constructed by taking natural logarithm and then multiply by 100 to form continuous compounding percentage. SEM and VAR techniques were used in this study for empirical analysis. The results showed that the Korean market have same results as previous results. The future market considers information fast than the spot market. regarding the volatility in the future and cash market, this study concludes that there is bidirectional causality exist in

future and cash market. trading in either spot market or future market produce significant volatility in series. This effect of causality is more pronounced in future market than in spot market. The influence of future trading on spot market is present on all contracts while the influence of spot market trading on future trading is present in only September contracts. It can be because of market fraction like short sale restriction and transaction cost, which restrict spot market to react faster than the future market.

Turkington & Walsh (1999) studied highly frequency causality between share prices index futures and AOI (All Ordinaries Index) in Australian market. They select sample data from 3rd January 1995 to 21 December 1995 in which a sample is drawn every 5 minutes. Which contains 51 pair of observation every day for almost 247 days with a total 12597 observations. By using data, spot index prices series is generated from future prices. They checked the cointegration between the series and then applied Granger Causality test and VAR. the results show that futures market leading the spot market is rejected, with bidirectional causality and many significant lags. Response time of future and spot index to shocks is about an hour but the response time of shocks is quite short of about five to fifteen minutes.

Rastogi & Athaley (2019) studied options market, future market and spot market and their respective volatilities. The aim of this study to find price volatility and the relationship among these three markets for hedging purpose and policies formulation. To do empirical study, Generalized Method of Moment (GMM) has been applied which have no problem of endogeneity and can capture SEM (Simultaneous Equation Modelling) of these three-market volatilities. The series are also checked for existence of structural break. The findings of this paper are volatility in options markets has no relation with future and spot market. However, the volatility in the spot market and volatility in future market in associated with each other.

The literature in which future market leads the spot market are discussed below. Hern´andez, et all (2011) studied agriculture future market. It studied to analyze the dependency level and transmission of volatility in main agricultures exchanges. They select Chicago and Kansas from United States, France and United Kingdom from Europe and China and Japan from Asia. They examined dynamics & cross dynamics in volatility across future markets in three agricultural products: Wheat, Soybeans and Corns. The time period that is selected for this study is from 2004 to 2009 for soybean and corn and from 2005 to 2009 for wheat. For finding the effects, multivariate Generalized Autoregressive Conditional Heteroskedasticity (GARCH)

techniques has been used. This technique was used to evaluate transmission of volatility, their sources of dependency and magnitude and how shocks and innovation transmit volatility in one market affects volatility in other markets. The result shows that the agricultural markets have both cross and own volatility spillover and have high interrelationship. And the dependency in agriculture market exist in most exchanges. The results also indicate that Chicago have significant role in the spillover effect on other markets specially in wheat and corn. Moreover, the interdependency has increased between markets in recent years. Hernandez & Torero, (2010) have also study future market of agriculture. They examine the relationship between spot prices and future prices in agriculture products. Weekly (Friday) spot prices data is collected from FAO (Food and Agriculture organization) of the United States International Commodity Prices Data. Closing prices for the future data is selected traded each Friday. To analyze this relationship, Linear and non-linear Granger causality test has been used. The analysis has been caried out on the future and spot returns and their volatility because the logs of future and spot prices were non-stationary. The findings indicate that future market generally leads spot market. Changes in prices in future market often change the prices in spot market causing lead lag relationship. This study has also supported the role of future markets as price discovery. The flow of information from future market to spot market increased over the past fifteen years, can be because of increase in use of more electronic trading.

Garbade & Silber (1983) studied the relationship between cash market and future market of storable commodities. The result concludes that there is cointegration between future market and cash market over the short run in all seven selected commodities especially in grains-oats, wheat, and corn. The silver and gold are though, highly cointegrated over one day. The second aim of this study was to know about the role of future trading in price discovery. The results conclude that future market does provide added information and helps in price discovery. Prices changes in future market lead changes in cash market. The result suggest that the added information first incorporate future market then it flows to cash market. Martikainen & Puttonen, (1994) also study price discovery in Finland Finnish stock future market and cash market. it investigates empirically that how information of world stock market effect small Finnish stock future index and cash market. The sample period cover data of Finnish stock future index from 2nd May 1988 to March end 1990. The Finish future stock return index shows granger causality with Finnish market stock

returns. The stock market is lagging to stock future index. The findings suggest that the restrictions of short selling and other market fraction causes stock market lagging to stock future index.

Lee, Stevenson, & Lee (2014) studied price volatility, future trading, and market efficiency in Europe Real Estate Future Securities. Future contracts in Europe market were introduced in 2007. There are two main objectives of this study. One is to find the effect of future trading on underline spot market and other is to find the effectiveness of future trading in minimizing risk. To carry out this research, daily closing prices data for spot market for sample period of October 2004 to 2010, September, were collected. The data examine for three years prior to introduction of future trading and three years after the introduction of future. The two indices naming FTSE ERPA/NAREIT (Financial Times Stock Exchange, European Public Real Estate Association, National Association of Real Estate Investment Trusts) Europe, and the Eurozone indices were used. The time span for future contracts data was from 2007, October, to 2010, September. To achieve the first objective traditional GARCH method was used. The result found that the introduction of future market does not destabilize the spot market. The result reveals that future market trading has effectively improved the quality and speed of information flow to spot market. To achieve the second objective of this study, Ordinary Least Square Model was used, and the result found that the future contracts were useful as an effective hedging instrument which leads to a decrease in the risk of about 64%.

Options and Index futures are blamed to increase volatility in spot prices. Percili & Koutmos, (1997) studied the Derivative Market and its impact on volatility on spot prices. The daily closing prices data is collected from United States Stock Exchange for S&P-500. The data sample was from 1953, 3rd January, to 1994, September 9 with total observation of 10499. Continuously compounded returns were constructed by taking natural logarithm. The result concludes that there is no effect of introduction of future trading on conditional and unconditional variation because there is already important development has occurred.

Edwards (1988) tried to examine whether the introduction of future market causes market volatility. Whenever there is volatility happen, people always seem to search for things to blame. When future trading was innovated, people were curious about the added information and its effect on spot market. The future trading of Equity began in 1982 and there is plenty of data that can be used in empirical analysis. To examine it empirically, day to day data of volatility of stock market of about 16 years from 1972 to 1987. The result conclude that these 16 years of data does not show

that future trading has caused volatility in stock market prices. In fact, the volatility in S&P500 was higher between 1973 to 1982 which was before the introduction of future trading. We also found that there is a short run volatility which may be caused by the expiration of future contracts, but this volatility does not hold for longer period of time.

Cash Market has also been studied to check effect of future trading on them. Similar study of Arshanapalli & Doukas (1994) study S&P-500 future index market and cash market to check whether they have same volatility pattern. A highly frequency minute by minute intraday data was collected. The sample periods start from 1st October 1987 to closing of trading on 30th October 1987. To carry out this research common ARCH testing is used. First to find ARCH effect, ARHC test is used and found ARCH effect in all series in almost every day except 20th October. After that common ARCH test was applied. The result showed that index cash and future market has no same pattern of volatility. The result also indicates that time varying volatility has not been supported by intraday series of future market and stock index.

There are some studies which only shows the long run relation from future to spot market. They did not find any short run relationship. Similar study by Sarwat, et all (2019) study the causality in prices in crude oil through future trading. Supply and demand determine the price of a commodity. Any speculation about trade creates speculative demand which disturb the market forces which disturb the economy. Similarly, the supply and demand can be affected by the speculation. This study tries to empirically find the validity of this argument. Crude Oil and United states have been selected to carry out research. Daily data of spot prices of intermediate crude oil of west taxes and future prices is selected and collected from NYME (New York Mercantile Exchange). The sample time period is from 2nd January to 2017, March 6th. Granger causality test is run to find empirical analysis. The result shows that there is causality which run from one-month future prices to the spot prices, meaning that the spot prices of crude oil are speculated by future trading. To find the long run causality, vector error correction term has been used with five lags suggested by Schwarz Information Criteria. The result shows that there is a long run causality which run from future contracts of crude oil to spot prices.

Darrat, Rahman, & Zhong (2002) studied the future trading role in the fluctuation of spot market. Sample for this study has monthly data for time period of November 1987 to November 1997 completing a total of 121 observations. Daily closing data at the end of the month is taken and then compute returns (as natural logarithm). The spot price data on S&P-500 is obtain form

CRSP (Center for Research in Security Prices) database of Chicago university and the data of future prices on S&P-500 were taken from FII (Future Industry Institute). Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) is used to find relationship. The results conclude that there is the future trading should not be blamed for the volatility in the spot market. The result support the contrary hypothesis that the fluctuation in future markets is because of the spot market volatility.

Srinivasan (2010) studied the NSE future and spot market and its price discovery in Indian market. The data selected for this study is daily closing prices of stock future and spot of eight IT companies' stocks which are traded in NSE (National Stock Exchange). The time period for this study is from 2005, 20th April, to 2008, 15th September. The cointegration of these two series was found by Augmented ducky Fuller Test and Philips perron test. To do an empirical analysis, Johansen Cointegration test was applied with VECM (Vector Error Correction Model) to find lead lag relation between NSE future and spot market. The result concludes that there is bidirectional causality between future and spot market of five out of eight IT companies. And there is spot lead to future in two companies and future lead to spot in company. This study also suggests that depending on the proportion of informed trader and uninformed traders, the following given lead lad relationship can differ in different sectors. In another study, (Srinivasan, 2012) studied Indian future spot commodity market by Johansen and VECM. The existence of long-term equilibrium is confirming by Johansen Cointegration in future market prices and spot market prices in commodity market. the VECM confirm that Mcxagri, Mcxmetal, Mcxenergy and Mcxcomdex play a vital role in price discovery meaning that there is information flow from spot to future market. This study provides valuable information to investor who are interested in investment on MCX future and spot market. When we have high volatility in spot market it affects future market. So, investor who are investing in future commodity market should always first watch the volatility in spot market for commodity.

Joseph, Sisodia, & Tiwari (2014) take a completely different approach for their study called frequency domain approach. In their study they try to find the strength, Direction, and size of causality between future prices and spot prices in Indian commodity market. the traditional approach allows us to find causality in time domain while the frequency domain approach can find the strength of causality. The data is collected from Indian commodity exchanges naming MCX and NCDEX for a time period of 2008, 3rd January to 2012, 31st December. Daily spot prices and

future prices from an Indian commodity market were selected. The results say that there is a strong unidirectional relationship exist from future market to spot market in all selected commodities. This also shows that the price discovery role of future market is present in all selected commodities. It also indicates that the Indian commodity market works efficiently. This result will help investors to know more about the future volatility in the market.

Debasish (2011) studied the causality between future and spot market in India. To carry out this study, pair wise Granger causality (1988) test is used which suggest that if there is a cointegration between time series data then there must be a at least one-way causation. For this study, daily series data of prices has been collected for both future and spot market. From six leading sectors of stock market naming: Banking, Automobiles, Gas Oil and Refineries, Pharmaceuticals, Information Technology, Cement, 40 samples stocks were taken. The time period of the study is 1st Jan 1997 to 31st May 2009. The study concludes that there are all automobiles' companies shows bidirectional causality between future and spot prices except Tata Motors. Out of nine, sevens banks have bidirectional causality between spot prices and future prices. In case of Gas, Oil and Refineries sector, HPC (Hindustan Petroleum Corporation Limited), IOC (Indian Oil Corporation), BPL (British Physical Laboratories**)** and Reliance show bidirectional causality between future prices and spot prices. Four out of sevens IT companies showed no Causality between Spot prices and future prices. All six pharmaceutical companies showed bidirectional causality between future prices and Spot prices.

Gupta & Singh (2006) studied the causality and price discovery in spot market and future market in Indian market. They take Daily closing index future values and SandP CNX from National Stock Exchange website for the period of June 2000 to February 2005 completing total observation of 1187. Returns is calculated as log ratio of present-day price to previous day prices. Vector Error Correction Model, Johansen Cointegration and GIRA (Generalized Impulse Response Analysis are applied one data to check the validity of hypothesis. By Johansen Cointegration we found that there is bilateral causality in Nifty Futures and Nifty Index meaning that movements in prices in Nifty futures influenced Nifty Index. By the help of F-Test, we found that the strength of causality from Nifty Futures to Nifty index is much stronger than the causality from Nifty index to Nifty Futures. The reason behind the efficiency in future market is because of the lower transaction cost involve in future market than the spot market. Moreover, the future

market provide flexibility to investors to speculate the prices of an asset without the burden of owing an asset by themselves.

Bhat & N. (2017) also studied the lead lag relation between future and spot prices in Nifty Companies. When SSF was introduced in India, it was solely responsible for great success of Indian Exchange till 2007 crisis. After crises the investor shifts from SSF to Index options market. Which decline the share of SSF in trading market. This was considered to be a mature stock amrket. This study was an attampt to find the impact of volatility and caulisty between spot and future of Nifty companies. Time period of 13 years from 2001.11.09 to 2014.03.31 were selected.l the result of this tsudy reveals that there exist causility between future prices and spot prices. moreover, these companies were shortb run as well as long run cointegarted.

Kaur (2019) study of finding causality between future and spot market in India. For this study, daily closing prices of stocks from Bombay Stock Exchange has been taken for the time period of 2011 to 2015. This study was based on time series secondary data. Different econometric techniques as test of stationarity, cointegration test and GC (Granger Causality) has been used. The results suggests that there is cointegration between future and spot market and movement of prices of future and spot are similar. Moreover, this study also suggests one way causality from spot to future market. Which means that the spot lead future market.

Ozdemir et al. (2019) studied the causality between future and spot markets is BII (Borsa Istanbul Index) and Dow Jones Industrial Average. The aim of his study was to check and confirm the causality between future and spot market. To carry out his research, he took BIST30 spot indices and BIST30 futures. Daily closing prices between 2009 and 2018 were taken to analyzed cointegration, causality and regression equation. The result concludes that there is two-way causality between BIST 30 spot returns and future returns. Moreover, this study also concluded that the BIST30 returns was higher than that of DOW returns.

Talbi et al. (2020) study tried to study granger cauyslity between future and spot returns of precious metals that is Gold, Platinum and Silver. Fro this study, daily data from January 02 2002 to January 13 2017 was taken. This study shows the following results, 1. The dependence between future return and spot return is relatively strong and time varying, 2. By using test for causility, this study detect a one way causility from future return to spot returns of precious metal. This study conclude that the information from past of FR improves forcasting in SR.

Özdemir (2021) also studied the causality between future and spot prices in Bitcoin. To carry out this research daily data from 02.23.2017 to 08.31.2021 of bitcoin was collected. ADF, Johansen Cointegration and VECM (Vector Error Correction Model) was used to analyze the data. For Stationarity, the data shows that the data is not stationary at level but at first difference it is stationary. The cointegration shows that there is long-term relationship between spot bitcoin market and future bitcoin market. The causality test suggests that there is one way causality from spot bitcoin market to future bitcoin market. This study concludes that a statement that bitcoin is a new tool of investment which attracts new investors and investor make investment for speculative preposes. That is why not like other trading instrument, here spot bitcoin prices in bitcoin market affect future bitcoin prices.

Ameur et al. (2021) is his studies tried to find the causality between spot and future commodity market. For that they have collected daily returns data. Six commodities indices were taken for this study. Based on these data, the study reached to findings that there is bidirectional causality between these two markets. moreover, this study also confirms that the future market provides platform for price discovery and also lead spot market. The changes in prices in commodity market first appear in future market then lag by spot market. These results also suggest that the informed investor prefer trading in future market as it provide low cost and high leverage effect.

Pakistani researchers have also tried to study the future trading effect on spot market. They also have tried to study stock futures stock market and also in crude oil case. Malik, Shah, & Khan (2013) examine the future trading in stock market and its effects on volatility and feedback trading in case of Pakistani market. The main objective of this study is to find the feedback of future trading on spot market. For this study, two approaches were followed. First, to compare the post and pre dynamics of core stocks. The second's approach was to compare the dynamics of single stock future cross sectionally. The results showed that the presence of the positive feedback trading in post and pre period for non SSF and SSF is statistically insignificant. The effect of SSF on volatility of spot prices was also found to be statistically insignificant. Overall, this result concludes that SSF trading neither increase nor decrease the spot trading.

Rafay et al. (2015) also studied future and spot prices volatility in Pakistan. The daily data of spot prices for crude oil is used which is collected from Thompson Reuter's database. And for

future, daily closing prices was taken from Pakistan Mercantile Exchange (PMEX) of Crude-100 Index. The time period is from 4th January 2010 to 31st December 2013. To carry out this research, an extended form of GARCH is used called Exponential GARCH. They aim of this paper was to check whether have persistent effect on volatility. The results indicate that shocks effect on volatility of future crude oil and volatility of spot crude oil is asymmetric. The study found that the negative shocks which increase price of crude oil are not completely compensated by positive shocks which reduce oil prices.

Jamal & Fraz, (2013) study Single Stock Future on which underlying spot stock is traded. For this study, twelve companies are selected from different sector traded in KSE (Karachi Stock Exchange). The time period was from 1st January 2005 to 31st December 2010 and monthly data is consider with completing a total observation of 72 for each company. Unit root test, Cointegration, VECM and Granger Causality through ARDL approach and Impulse response, Variance Decomposition are used. The result found that there is long run relationship between spot prices and future prices. The future prices play vital role as price discovery because in helps to determine its underlying spot prices. Impulse response suggested that the future market shocks are explained by innovation in them and have less impact on spot prices. VECM conclude that the speed of adjustment is fast in all selected companies.

Awan & Shah, Spring (2014) study SSF (Single Stock Future), trade volume and its effect on Pakistani stock exchange. The data sample is collected from July 1st, 2001, to end of February 2008. Daily closing prices and trading volume data is retrieved form business recorder. The data was one-year pre-event and one-year post event. They analyze 26 Pakistani firm out of 46 firms of Single Stock Future for Price and Volume effect through dummy variable and t statics technique. The event study concludes that there is very less impact of future trading on their underlined spot returns. They concluded that there is decrease in trade volume and increase in return in post SSF and vice versa for post SSF trading in market.

Looking at the literature, it has been found conflicting results about price discovery, market volatility, transmission of volatility and causality reflecting their specific market behavior. Khan & Hijazi (2009) study SSF trading and Stock Prices volatility in Pakistani market. The data is collected for SSF from Karachi Stock Exchange (KSE). The sample period is taken from 1st June 1999 to end of June 2008. Total of 28 stocks are selected which have complete two years of daily data of price observation and trade volume on both side of future listings dates. Different

econometric technique was used to conclude the study. They find that there is positive relation between spot prices volatility and trading volume with future trading. The causality relation is also studied by (Min & Najand, 1999) and (Pathak, 2009).

In case of Pakistan, there are fewer studies that has find the price discovery in Pakistan future and spot market. The gap that we have found in these studies is that none of it has find causality between them that whether it is a unidirectional phenomenon or bidirectional phenomena or neither of it. With best of my knowledge, no study has taken the 2008 global crisis in their study that whether the pre 2008 or post 2008 behavior of future and spot market is same or not.

2.1 Hypothesis:

To find objective, three hypothesis statement has been written for 25 companies. The hypotheses are for finding the causality between return of Spot market and future market.

- **Hypotheses:**
  - Ho: there is no long run relationship between SR and FR
  - Ha: there is long run relationship between SR and FR
  - Ho: there is no short run relationship between SR and FR
  - Ha: there is short run relationship between SR and FR
  - Ho: there is no causality between SR and FR
  - Ha: there is causality between SR and FR

CHAPTER 3

METHODOLOGY AND ECONOMETRIC TECHNIQUES

3. Methodologies and Econometric Techniques

For this research daily closing data of both future and spot is taken to find the causality between series. The data is taken for 25 companies listed in PSX. The companies name along with their symbol and sector details are mentioned in Appendix A.

To carry out further test and analytical calculations the data is changed in return series by taking the first difference of consecutive series.

$$Rt = \ln(P_t / P_{t-1}) \quad (3.1)$$

Where Rt is the return series

Pt is the price in the current period

And Pt-1 is the price in the previous period

All tests were done on the return series for all companies.

3.1 Descriptive Statistics:

Descriptive statistics summarizes the data for better understanding. The information that will be derived from descriptive statistics are mean, median, variance, covariance, standard deviation, Kurtosis, and Skewness. Through descriptive station average daily returns can be analyzed with its respective risk.

3.2 Unit root test:

For any time, series data to be analyzed, first the stationarity of data is compulsory to check. (Dickey, 2015) explains the importance of finding stationarity in the data.

We use three equations for Augmented Dicky Fuller test according to specification of data. These basic equations for stationarity are given below

$$\Delta yt = \gamma yt - 1 + vt \quad (3.2)$$

$$\Delta yt = \alpha + \gamma yt - 1 + vt \quad (3.3)$$

$$\Delta yt = \alpha + \gamma yt - 1 + \lambda t + vt \quad (3.4)$$

The first equation is for no constant and no trend. The second equation is for constant and no trend, while the third equation is for both constant and trend. The ADF test add lagged difference to each model. The equation is written below in above order.

$$\Delta yt = \gamma yt - 1 + \sum_{s=1}^{m} as\Delta yt - s + vt \quad (3.5)$$

$$\Delta yt = \alpha + \gamma yt - 1 + \sum_{s=1}^{m} as\Delta yt - s + vt \quad (3.6)$$

$$\Delta yt = \alpha + \gamma yt - 1 + \lambda t + \sum_{s=1}^{m} as\Delta yt - s + vt \quad (3.7)$$

ADF test has been run on log of original spot and future prices of stocks. The null hypothesis of the ADF test is that "there is unit root in the data" and it can be checked by probability of t-Statistics. The probability value for all companies is less than 0.05 meaning that we will reject the null hypothesis and accept alternate hypothesis meaning that there is no problem of stationarity in the series.

To find the cointegration between Spot and Future series we first need find the optimal lag lengths. Selection of proper lag length is compulsory for long term cointegration between series. Akaike information criteria is the most widely and better used technique for lag selection (Liew, Venus. 2004).

Among other lag selection criteria, Akaike Information Criteria has been selected for lag selection. There are five different types of models: a model with no trend and intercept, with no trend but have intercept, a linear model with intercept but no trend, with intercept and a trend, a quadratic model with intercept and trend. The result of our data shows that that data has no intercept and trend.

3.3 Johansen Cointegration Test:

There are two test that can be used to find the cointegration between the two series. Auto Regressive Distribution Lag (ARDL) and the Johansen cointegration test. If the series are cointegrated of different order than we will be using ARDL method but as our Return series data for all companies are cointegrated of the same order that why we will be using Johansen cointegration test. Cointegration test has been used for more than twenty years now and it is still the best test that many researchers rely one. But there is Strict assumption that the series must be cointegrated of the same order (Hjalmarsson & Österholm, 2007). This cointegration test does not explain the causality between Spot and Future data but it will only explain whether the two series move together in the long run or not.

3.4 Variance Decomposition:

Louangrath, Paul. (2013) argued that variance decomposition can be used to decompose the effect of variation in the data of itself and the variation of the other variable. In our case, how much in spot returns can be explained by variation in spot return and future return. And how much future return can be explained by variation in future return and spot returns. The objective of Variance decomposition is to find the effect of variance with in the SR and FR of same companies.

3.5 Impulse Response

Koop, et all (1996) explains Impulse response is a technique that find the effect of shock in a series on the behavior of that series. It is a best way to graphically explain the shock persistence in a series. It is a kind of conceptualize experiment in which we made a shock of one unit or one standard deviation and then we let series to reflect the persistence. The objective of Impulse response is to know about the effect of shock graphically.

3.6 Vector Error Correction Model:

It is to accept that when two variables are co related in a long run then a short run co relation to be find as well. For this after finding long run relationship VECM technique is used to find short run relationship between future and spot returns. Future returns are taken as dependent variable and spot returns are taken as independent variable. When the value of ECT (Error Correction Term) is negative and the probability of that value is less than 5% then it is considered to be statistically significant.

3.7 Engle Granger Causality

(Granger, 1969) tries to find the direction and causality between two related variables and tries to find whether the feedback is occurring or not. (Obadi & Korcek, 2018) explains the statement by Granger that the meaning of X cause Y does not mean that Y is the result or outcome of X, but it means that how much X and Y at present can be explained by the past value of X and Y. Mathematically Granger causality equation can be written as

$$\ln X = \alpha_1 + \sum_{i-1}^{m} \beta_i \, X_{t-i} + \sum_{j=1}^{n} \lambda_j \, lnY_{t-j} + v_t \tag{3.8}$$

$$\ln Y = \alpha_2 + \sum_{i-1}^{m} \gamma_i \, Y_{t-i} + \sum_{j=1}^{n} \delta_j \, lnX_{t-j} + \varepsilon_t \tag{3.9}$$

Note: α_1, α_2 are constants. v_t, ε_t are white noise. i, j is lag length. t – time period.

The Ho Hypothesis for the test below is

Null Hypothesis: SR does not Granger Cause FR

FR does not Granger Cause SR

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Descriptive statistics

Table 4.1: Descriptive statistics of Fertilizer Sector

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
EFERT SR	0.00006	0.0000	0.072	-0.091	0.015	-0.661	8.817
EFERT FR	0.00005	0.0006	0.091	-0.106	0.033	-0.099	2.720
ENGRO SR	0.00056	0.0000	0.188	-0.288	0.025	-0.784	15.055
ENGRO FR	0.00054	0.0000	4.123	-4.157	0.114	-0.450	1238.365
FFBL SR	0.00043	0.0000	0.181	-0.140	0.022	0.166	9.962
FFBL FR	0.00043	0.0000	0.173	-0.118	0.024	0.204	8.089
FFC SR	0.00014	0.0003	0.132	-0.449	0.021	-5.698	111.504
FFC FR	0.00015	0.0001	0.122	-0.420	0.022	-4.110	73.480

Descriptive statistics shown above is for both SR and FR of Fertilizer sector which include EFERT, ENGRO, FFBL and FFC. Out of these four companies ENGRO SR shows highest average daily return of 0.056% with 2.5% risk factor. ENGRO FR hold the second position of average return daily of 0.054% with 11.4% risk factor. This shows that the future trading in ENGRO stocks is riskier that spot trading of ENGRO. FFBL SR and FR both has same average daily return of 0.043% with slightly greater risk of 2.4% for FR instead of 2.2% for SR. FFC SR and FR has 0.014% and 0.015% with risk factor of 2.1% and 2.2% respectively. EFERT has lowest return of 0.006% for SR and 0.005% for FR with 1.5% for SR and 3.3% for FR. The common observation here is that for all companies the risk factor for FR is higher than SR. All companies except FFBL (both SR and FR) are negatively skewed as can be seen by negative sign.

Table 4.2: Descriptive statistics of Commercial Banks Sector

	Mean	Median	Maximum	Minimum	Std. Dev.	skewness	kurtosis
BAFL SR	-0.00058	-0.00035	0.149	-0.995	0.037	-13.433	352.044
BAFL FR	-0.00059	0.00000	0.328	-0.975	0.042	-8.668	203.716
BOP SR	-0.00127	-0.00118	0.709	-0.467	0.038	2.546	103.108
BOP FR	-0.00114	0.00000	0.744	-0.484	0.043	2.176	78.423
FABL SR	-0.00014	0.00000	0.188	-0.265	0.032	-1.621	18.171
FABL FR	-0.00015	0.00000	0.189	-0.334	0.036	-1.828	17.612
AKBL SR	0.00005	0.00000	0.072	-0.226	0.021	-2.804	32.340
AKBL FR	0.00005	-0.00089	0.196	-0.263	0.078	-0.078	2.549
UBL SR	-0.00064	-0.00093	0.072	-0.092	0.020	-0.154	5.536
UBL FR	-0.00056	-0.00207	0.126	-0.165	0.044	0.005	2.946
HBL SP	-0.00007	0.00062	0.059	-0.078	0.019	-0.449	5.765
HBL FR	-0.00007	0.00023	0.065	-0.084	0.020	-0.442	5.804

In commercial bank sector, most of companies have recorded negative average return(daily) except for AKBL (both SR and FR). AKBL, both SR and FR has 0.005% of average daily return with risk factor of 2.1% and 7.8% respectively. Here we can also see that future trading is more that Spot trading. BOP has highest negative daily return for both SR and FR of 0.127% and 0.114% respectively. The risk factor is higher for future trading than spot trading with value 4.3% and 3.8% respectively. SR of BAHL, FABL UBL, and HBL is -0.058%, -0.014%, -0.064% and -0.007% with risk factor of 3.7%, 3.2%, 2.0% and 1.9% respectively. Moreover, the FR of BAHL, FABL UBL, and HBL is -0.059%, -0.015%, -0.056% and -0.007% with risk factor of 4.2%, 3.6%, 4.4% and 2.0% respectively. Here we can also see that the future trading is riskier than spot trading. Both SR and FR of BAHL, FABL, AKBL and HBL are negatively skewed. Both series of BOP is positively skewed. The SR of UBL is negatively skewed while FR of the same company is positively skewed.

Table 4.3: Descriptive statistics of Cement Sector

	Mean	Median	Maximum	Minimum	Std. Dev.	skewness	kurtosis
DGKC SR	0.00035	0.00000	0.143	-0.145	0.025	-0.120	5.045
DGKC FR	0.00033	0.00000	0.128	-0.163	0.027	-0.280	5.852
FCCL SR	-0.00043	-0.00204	0.075	-0.366	0.028	-2.847	41.887
FCCL FR	-0.00051	-0.00221	0.259	-0.368	0.074	-0.017	3.535
POWER SR	0.00018	-0.00412	0.162	-0.143	0.031	0.763	7.382
POWER FR	-0.00013	0.00163	0.319	-0.296	0.109	0.025	2.908

In cement sector three companies are taken and their descriptive statistics shows that the highest positive daily return is 0.035% for DGKC SR with 2.5% risk factor while DGKC FR average daily return is on second positive on 0.033% with risk factor 2.7%. The FCCL FR has highest negative average daily return of -0.051% with risk factor of 7.4% while second highest negative average return is for FCCL SR of -0.043% with 2.8% risk factor. POWER SR is having positive average return of 0.018% with 3.1% risk factor. The POWER FR has highest risk factor of 10.9% with only -0.013% average daily return. Both DGKC and FCCL are negatively skewed while POWER is positive skewed.

Table 4.4: Descriptive statistics of Refinery Sector

	Mean	Median	Maximum	Minimum	Std. Dev.	skewness	kurtosis
ATRL SR	0.00145	0.00039	0.072	-0.078	0.035	-0.078	2.710
ARTL FR	0.00150	-0.00027	0.106	-0.113	0.038	0.044	2.880
CYNERGY SR	-0.00022	-0.00203	0.131	-0.137	0.034	0.491	5.080
CYNERGY FR	-0.00045	-0.00161	0.285	-0.288	0.103	0.037	2.754

In refinery section, two companies have been taken. The ATRL SR and FR have positive return of 0.145% and 0.150% with risk factor of 3.5% and 3.8% respectively. On the other hand, CYNERGY SR and FR have negative average daily return of -0.022% and 0.045% with risk factor of 3.4% and 10.3% respectively. Only ATRL SR is positively skewed, and the remaining are positively skewed.

Table 4.5: Descriptive statistics of Textile Composite Sector

	Mean	Median	Maximum	Minimum	Std. Dev.	skewness	kurtosis
GATM SR	0.00077	-0.00079	0.072	-0.078	0.025	0.041	4.224
GATM FR	0.00079	0.00009	0.203	-0.267	0.074	-0.079	2.830
NCL SR	0.00006	0.00000	0.072	-0.078	0.024	-0.010	3.797
NCL FR	-0.00004	0.00058	0.220	-0.248	0.080	-0.009	2.679
NML SR	-0.00065	-0.00132	0.267	-0.078	0.026	1.489	20.529
NML FR	-0.00060	-0.00083	0.292	-0.145	0.041	0.499	7.009

Similarly, for textile section three companies are selected in which GATM SR and FR has positive average daily return of 0.077% and 0.079% with 2.5% and 7.4% risk factor, respectively. Moreover, both NML SR and FR have negative average daily return of -0.065% and -0.060% with risk factor of 2.6% and 4.1% respectively. The SR of NCL has positive daily return of 0.006% with risk factor of 2.4% and FR of NCL has negative return of -0.004% with high risk factor of 8.0%. Both series of NCL are negatively skewed while both series of NML is positively skewed. The SR of GATM is positive skewed and FR of GATM is negatively skewed.

Table 4.6: Descriptive statistics of Oil and Gas Sector

	Mean	Median	Maximum	Minimum	Std. Dev.	skewness	kurtosis
PSO SR	-0.00067	-0.00201	0.049	-0.056	0.020	0.128	3.229
PSO FR	-0.00067	-0.00238	0.059	-0.060	0.021	0.058	3.137
PPL SR	-0.00085	-0.00184	0.072	-0.078	0.022	0.184	5.109
PPL FR	-0.00086	-0.00207	0.092	-0.118	0.029	0.098	3.874
OGDC SR	-0.00086	-0.00179	0.072	-0.078	0.021	0.266	5.405
OGDC FR	-0.00074	-0.00092	0.126	-0.107	0.031	-0.072	3.866

All companies in this sector have negative average return. PPL SR and FR has highest negative return of -0.085 and -0.086 with risk factor of 2.2% and 2.9% respectively. While PSO SR and FR have lowest negative average daily return of -0.067%, -0.067% with risk factor of 2.0% and 2.1% respectively. OGDC SR has negative return of -0.086% with risk factor of 2.1% and OGDC FR has negative return of -0.074% with risk factor of 3.1%. All series are positive skewed except of OGDC FR which is negative skewed.

Table 4.7: Descriptive statistics of: Power Generation and Distribution, Technology and Communication, Cable & Electrical Goods, Synthetic & Rayon sectors

	Mean	Median	Maximum	Minimum	Std. Dev.	skewness	kurtosis
HUBC SR	-0.00017	-0.00131	0.072	-0.078	0.020	0.247	5.430
HUBC FR	-0.00016	-0.00023	0.127	-0.130	0.031	0.099	3.678
TRG SR	0.00179	-0.00034	0.079	-0.080	0.035	0.054	2.548
TRG FR	0.00170	-0.00083	0.261	-0.290	0.068	0.002	3.869
PAEL SR	-0.00029	-0.00068	0.072	-0.078	0.029	0.025	3.076
PAEL FR	-0.00023	-0.00153	0.249	-0.193	0.071	0.141	3.012
DSFL SR	-0.00033	0.00000	0.159	-0.140	0.033	0.230	5.724
DSFL FR	-0.00031	0.00000	2.721	-2.715	0.184	0.059	206.830

In this, four companies are given belonging to different sector of PSX. HUBC of Power Generation and Distribution has both SR and FR negative daily return of -0.017% and -0.016% with risk factor of 2.0% and 3.1% respectively. The PAEL, SR and FR, and DSFL, SR and FR, have negative return of -0.029%, -0.023%, -0.033%, -0.031% with risk factor of 2.9%, 7.1% 3.3% and 18.4% respectively. TRG SR and FR, both have positive return of 0.179% and 0.170% with risk factor of 3.5% and 6.8% respectively. All companies are positively skewed.

4.2 Augmented Dicky Fuller (ADF) test:

ADF test has been run for companies of both Spot Returns and Future Returns. The results are given below in separate tables of companies belonging to different sectors of PSX.

Table 4.8: ADF Test of Fertilizer Sector

		ADF(Level)		ADF (1st Difference)	
		t-Statistics	**Probability**	**t-Statistics**	**Probability**
EFERT	SR	0.10	0.7137	-30.07	0.0000
	FR	0.09	0.7114	-19.57	0.0000
ENGRO	SR	-2.07	0.2586	-51.92	0.0001
	FR	-2.47	0.1234	-31.16	0.0000
FFBL	SR	0.70	0.8659	-44.56	0.0001
	FR	0.65	0.8570	-49.47	0.0001
FFC	SR	0.21	0.7486	-47.36	0.0001
	FR	0.21	0.7472	-48.34	0.0001

Statistics mentioned in above tables of ADF shows that at level we accept null hypothesis which is "there is unit root in the data" meaning that the data is not stationary at level which can be seen by probability value of data. That is why we checked stationarity of these companies at 1st difference and the results shows that all series are stationary at 1st difference.

Table 4.9: ADF Test of Commercial Banks Sector

		ADF(Level)		ADF (1st Difference)	
		t-Statistics	**Probability**	**t-Statistics**	**Probability**
BAFL	SR	-0.98	0.2937	-37.75	0.0000
	FR	-0.92	0.3200	-40.01	0.0000
BOP	SR	-1.30	0.1802	-36.32	0.0000
	FR	-1.07	0.2581	-38.26	0.0000
FABL	SR	-0.16	0.6276	-27.22	0.0000
	FR	-0.20	0.6157	-30.84	0.0000
AKBL	SR	-1.68	0.4397	-23.48	0.0000
	FR	-2.43	0.1346	-20.97	0.0000
UBL	SR	-0.86	0.3412	-24.36	0.0000
	FR	-0.79	0.3725	-27.64	0.0000
HBL	SR	-0.14	0.6363	-20.75	0.0000
	FR	-0.09	0.6528	-21.66	0.0000

Statistics mentioned in above tables of ADF shows that at level we accept null hypothesis which is "there is unit root in the data" meaning that the data is not stationary at level which can be seen by probability value of data. That is why we checked stationarity of these companies at 1st difference and the results shows that all series are stationary at 1st difference.

Table 4.10: ADF Test of Cement Sector

		ADF(Level)		ADF (1st Difference)	
		t-Statistics	**Probability**	**t-Statistics**	**Probability**
DGKC	SR	0.51	0.8260	-44.60	0.0001
	FR	0.49	0.8210	-48.65	0.0001
FCCL	SR	-0.52	0.4908	-25.26	0.0000
	FR	-0.32	0.5684	-23.29	0.0000
POWER	SR	-0.01	0.6790	-23.65	0.0000
	FR	-0.10	0.6481	-18.39	0.0000

Statistics mentioned in above tables of ADF shows that at level we accept null hypothesis which is "there is unit root in the data" meaning that the data is not stationary at level which can be seen by probability value of data. That is why we checked stationarity of these companies at 1st difference and the results shows that all series are stationary at 1st difference.

Table 4.11: ADF Test of Refinery Sector

		ADF(Level)		ADF (1st Difference)	
		t-Statistics	**Probability**	**t-Statistics**	**Probability**
ATRL	SR	0.95	0.9087	-21.66	0.0000
	FR	0.89	0.9000	-24.18	0.0000
CNERGY	SR	-0.37	0.5515	-26.94	0.0000
	FR	-0.35	0.5593	-23.11	0.0000

Statistics mentioned in above tables of ADF shows that at level we accept null hypothesis which is "there is unit root in the data" meaning that the data is not stationary at level which can be seen by probability value of data. That is why we checked stationarity of these companies at 1st difference and the results shows that all series are stationary at 1st difference.

Table 4.12: ADF Test of Textile Sector

		ADF(Level)		ADF (1st Difference)	
		t-Statistics	**Probability**	**t-Statistics**	**Probability**
GATM	SR	0.66	0.8592	-23.52	0.0000
	FR	0.39	0.7971	-28.92	0.0000
NCL	SR	-0.03	0.6727	-26.78	0.0000
	FR	-0.13	0.6400	-27.04	0.0000
NML	SR	-0.63	0.4451	-22.60	0.0000
	FR	-0.62	0.4473	-34.26	0.0000

Statistics mentioned in above tables of ADF shows that at level we accept null hypothesis which is "there is unit root in the data" meaning that the data is not stationary at level which can be seen by probability value of data. That is why we checked stationarity of these companies at 1st difference and the results shows that all series are stationary at 1st difference.

Table 4.13: ADF Test of Oil and Gas Sector

		ADF(Level)		ADF (1st Difference)	
		t-Statistics	**Probability**	**t-Statistics**	**Probability**
PSO	SR	-0.67	0.4267	-14.63	0.0000
	FR	-0.71	0.4081	-16.22	0.0000
PPL	SR	-1.01	0.2827	-21.38	0.0000
	FR	-0.97	0.2957	-28.70	0.0000
OGDC	SR	-0.94	0.3082	-21.16	0.0000
	FR	-0.75	0.3930	-29.09	0.0000

Statistics mentioned in above tables of ADF shows that at level we accept null hypothesis which is "there is unit root in the data" meaning that the data is not stationary at level which can be seen by probability value of data. That is why we checked stationarity of these companies at 1st difference and the results shows that all series are stationary at 1st difference.

Table 4.14: ADF Test of: Power Generation and Distribution, Technology and Communication, Cable & Electrical Goods, Synthetic & Rayon Sector

		ADF(Level)		ADF (1st Difference)	
		t-Statistics	**Probability**	**t-Statistics**	**Probability**
HUBC	SR	-0.31	0.5730	-28.25	0.0000
	FR	-0.34	0.5634	-27.26	0.0000
TRG	SR	1.49	0.9664	-26.58	0.0000
	FR	1.53	0.9695	-22.82	0.0000
PAEL	SR	-0.30	0.5760	-24.11	0.0000
	FR	-0.30	0.5766	-21.45	0.0000
DSFL	SR	-0.53	0.4891	-27.96	0.0000
	FR	-0.57	0.4703	-9.33	0.0000

Statistics mentioned in above tables of ADF shows that at level we accept null hypothesis which is "there is unit root in the data" meaning that the data is not stationary at level which can be seen by probability value of data. That is why we checked stationarity of these companies at 1st difference and the results shows that all series are stationary at 1st difference.

4.3 Lag Selection Criteria

The result of lag selection model is mentioned in the table below. The best suited model can be seen by "*" in the table in front of each company.

Table 4.15: Lag Selection for Fertilizer Sector

Data Trend:		None	None	Linear	Linear	Quadratic
Company Name	**No. of Lags**	**No Trend, No Intercept**	**No Trend, Intercept**	**No Trend, Intercept**	**Trend, Intercept**	**Trend, Intercept**
EFERT	0	-10.20	-10.20	-10.19	-10.19	-10.19
	1	-10.36	-10.38*	-10.39	-10.39	-10.38
	2	-10.35	-10.38	-10.38	-10.38	-10.38
ENGRO	0	-6.55	-6.55	-6.55	-6.55	-6.54
	1	-6.60*	-6.61	-6.61	-6.61	-6.60
	2	-6.60	-6.60	-6.60	-6.60	-6.60
FFBL	0	-10.27	-10.27	-10.27	-10.27	-10.26
	1	-10.32*	-10.32	-10.32	-10.32	-10.32
	2	-10.32	-10.32	-10.32	-10.32	-10.32
FFC	0	-9.90	-9.90	-9.90	-9.90	-9.90
	1	-9.98	-9.98	-9.98	-9.98	-9.97
	2	-9.97	-9.98	-9.97*	-9.98	-9.98

In above statistics it can be seen that for EFERT the optimal lag length is 1 with No trend and intercept. For both ENGRO and FFBL, the lag length is 1 with no trend and intercept. FFC has optimal lag length of 2 with linear data trend with intercept and no trend.

Table 4.16: Lag Selection for Commercial Banks Sector

Data Trend:		None	None	Linear	Linear	Quadratic
Company Name	**No. of Lags**	**No Trend, No Intercept**	**No Trend, Intercept**	**No Trend, Intercept**	**Trend, Intercept**	**Trend, Intercept**
BAFL	0	-8.10	-8.10	-8.10	-8.10	-8.10
	1	-8.21*	-8.22	-8.22	-8.21	-8.22
	2	-8.21	-8.21	-8.21	-8.21	-8.21
BOP	0	-8.16	-8.16	-8.16	-8.16	-8.16
	1	-8.28*	-8.28	-8.28	-8.28	-8.28
	2	-8.28	-8.28	-8.28	-8.28	-8.28
FABL	0	-8.60	-8.60	-8.59	-8.59	-8.60
	1	-8.63	-8.63	-8.63	-8.63	-8.63*
	2	-8.62	-8.62	-8.62	-8.63	-8.63
AKBL	0	-7.69	-7.69	-7.68	-7.68	-7.67
	1	-7.83	-7.83*	-7.83	-7.83	-7.83
	2	-7.82	-7.82	-7.82	-7.82	-7.82
UBL	0	-9.22	-9.22	-9.21	-9.21	-9.21
	1	-9.36	-9.41	-9.41	-9.41	-9.41
	2	-9.35	-9.41	-9.41	-9.41	-9.41*
HBL	0	-13.59	-13.59	-13.58	-13.58	-13.57
	1	-13.66	-13.73*	-13.74	-13.73	-13.73
	2	-13.65	-13.73	-13.73	-13.72	-13.72

We can see the results for commercial banks that both BAFL and BOP have one lag length having no data trend with no trend and no intercept. AKBL and HBL have no data trend with trend and no intercept with optimal lag length of one. FABL has quadratic data trend with trend and intercept having optimal lag length of one. Lastly, UBL has lag length of two having quadratic data trend with trend and intercept.

Table 4.17: Lag Selection for Cement Sector

Data Trend:		None	None	Linear	Linear	Quadratic
Company Name	**No. of Lags**	**No Trend, No Intercept**	**No Trend, Intercept**	**No Trend, Intercept**	**Trend, Intercept**	**Trend, Intercept**
DGKC	0	-9.75	-9.75	-9.75	-9.75	-9.75
	1	-9.88*	-9.88	-9.88	-9.88	-9.88
	2	-9.88	-9.88	-9.88	-9.88	-9.88
FCCL	0	-7.40	-7.40	-7.39	-7.39	-7.39
	1	-7.50	-7.53*	-7.54	-7.54	-7.53
	2	-7.49	-7.53	-7.53	-7.53	-7.53
POWER	0	-6.35	-6.35	-6.34	-6.34	-6.33
	1	-6.40	-6.49*	-6.49	-6.49	-6.48
	2	-6.38	-6.48	-6.48	-6.48	-6.48

Here we can see that both FCCL and POWER has optimal lag length of one with No data trend and intercept and no trend. DGKC has also one optimal lag length but with None data trend and No trend and No intercept.

Table 4.18: Lag Selection for Refinery Sector

Data Trend:		None	None	Linear	Linear	Quadratic
Company Name	**No. of Lags**	**No Trend, No Intercept**	**No Trend, Intercept**	**No Trend, Intercept**	**Trend, Intercept**	**Trend, Intercept**
ATRL	0	-10.00	-10.00	-9.99	-9.99	-9.99
	1	-10.03	-10.13*	-10.13	-10.13	-10.12
	2	-10.02	-10.12	-10.12	-10.12	-10.12
CNERGY	0	-6.22	-6.22	-6.21	-6.21	-6.21
	1	-6.29	-6.41*	-6.41	-6.41	-6.41
	2	-6.28	-6.41	-6.41	-6.40	-6.40

Here both companies have one lag length with None data trend having intercept and no trend.

Table 4.19: Lag Selection for Textile Sector

Data Trend:		None	None	Linear	Linear	Quadratic
Company Name	**No. of Lags**	**No Trend, No Intercept**	**No Trend, Intercept**	**No Trend, Intercept**	**Trend, Intercept**	**Trend, Intercept**
GATM	0	-7.51	-7.51	-7.50	-7.50	-7.50
	1	-7.63	-7.67*	-7.67	-7.67	-7.66
	2	-7.62	-7.66	-7.66	-7.66	-7.66
NCL	0	-7.51	-7.51	-7.50	-7.50	-7.50
	1	-7.65	-7.68*	-7.69	-7.68	-7.68
	2	-7.64	-7.68	-7.68	-7.68	-7.68
NML	0	-9.07	-9.07	-9.06	-9.06	-9.05
	1	-9.18	-9.22*	-9.22	-9.22	-9.22
	2	-9.17	-9.21	-9.21	-9.21	-9.21

In this sector of PSX we can see that all three companies have one optimal lag length with None data trend having intercept and no tend.

Table 4.20: Lag Selection for Oil and Gas Sector

Data Trend:		None	None	Linear	Linear	Quadratic
Company Name	**No. of Lags**	**No Trend, No Intercept**	**No Trend, Intercept**	**No Trend, Intercept**	**Trend, Intercept**	**Trend, Intercept**
PSO	0	-12.73	-12.73	-12.72	-12.72	-12.71
	1	-12.81	-12.86*	-12.86	-12.85	-12.85
	2	-12.78	-12.84	-12.84	-12.85	-12.85
PPL	0	-10.57	-10.57	-10.57	-10.57	-10.56
	1	-10.71	-10.72*	-10.73	-10.73	-10.72
	2	-10.70	-10.72	-10.72	-10.72	-10.72
OGDC	0	-10.01	-10.01	-10.01	-10.01	-10.00
	1	-10.16	-10.20*	-10.20	-10.20	-10.20
	2	-10.15	-10.20	-10.20	-10.20	-10.20

In this as well we can see that all three companies have one optimal lag length with None data trend having intercept and no trend.

Table 4.21: Lag Selection for: Power Generation and Distribution, Technology and Communication, Cable & Electrical Goods, Synthetic & Rayon Sectors

Data Trend:		None	None	Linear	Linear	Quadratic
Company Name	No. of Lags	No Trend, No Intercept	No Trend, Intercept	No Trend, Intercept	Trend, Intercept	Trend, Intercept
HUBC	0	-10.04	-10.04	-10.03	-10.03	-10.03
	1	-10.21	-10.22*	-10.23	-10.23	-10.22
	2	-10.20	-10.23	-10.23	-10.23	-10.23
TRG	0	-7.17	-7.17	-7.17	-7.17	-7.17
	1	-7.23	-7.35	-7.35	-7.35	-7.35*
	2	-7.23	-7.34	-7.34	-7.34	-7.34
PAEL	0	-7.37	-7.37	-7.36	-7.36	-7.36
	1	-7.47	-7.57*	-7.57	-7.57	-7.57
	2	-7.46	-7.57	-7.57	-7.57	-7.57
DSFL	0	-5.38	-5.38	-5.38	-5.38	-5.38
	1	-5.64	-5.63	-5.63	-5.64*	-5.64
	2	-5.63	-5.63	-5.63	-5.64	-5.64

Here HUBC and PAEL is having one optimal lag length with None Data trend having intercept and no trend. DSFL is a having one optimal lag length with linear data trend having intercept and trend. TRG is also having one lag length but with quadratic data trend having intercept and trend.

4.4 Johansen Cointegration

The table above shows the result of Johansen Cointegration Test. The null hypothesis for "NONE" is "there is no cointegration between the variables." And the alternate hypothesis is "there is a cointegration between the variables. There are trace statistics and Max-Eigen Statistics. For both Trace and Max-Eigen Statistics, the "NONE" null hypothesis is same. If the value of T-Statics is greater than its critical value then we will reject the null hypothesis and vice versa. The same goes for the Max Eigen statistics, if the value of Max-Eigen statistics is greater than its critical value we will reject the null hypothesis and vice versa.

4.4.1 Fertilizer Sector

Table 4.22: Trace Statistics

	Hypothesis	Eigen-value	T-Statistics	Critical Value 5%	Remarks
EFERT	None *	0.333	379.992	20.262	1 Cointegration equation
	At most 1	0.008	7.191	9.165	
ENGRO	None *	0.172	538.099	12.321	1 Cointegration Equation
	At most 1	0.000	0.996	4.130	
FFBL	None *	0.120	275.737	12.321	1 Cointegration Equation
	At most 1	0.000	0.405	4.130	
FFC	None *	0.078	187.229	15.495	2 Cointegration Equation
	At most 1 *	0.006	12.636	3.841	

Table 4.23: Max Eigen Statistics

	Hypothesis	Eigen-value	MaxEigen Value	Critical Value 5%	Remarks
EFERT	None *	0.333	372.801	15.892	1 Cointegration Equation
	At most 1	0.008	7.191	9.165	
ENGRO	None *	0.172	537.102	11.225	1 Cointegration Equation
	At most 1	0.000	0.996	4.130	
FFBL	None *	0.120	275.331	11.225	1 Cointegration Equation
	At most 1	0.000	0.405	4.130	
FFC	None *	0.078	174.592	14.265	2 Cointegration Equation
	At most 1 *	0.006	12.636	3.841	

The above tables show Johansen cointegration result for companies of fertilizer sector. The results can be seen by Trace Statistics and Max Eigen statistics with its critical values. The result shows that there is one cointegration equation as denoted by "*" for all companies except for FFC in which we can see that the critical value of both Trace and Max-Eigen is less than its Trace and Max-Eigen is values at NONE as well as at most 1. In this case we will reject null hypothesis for both NONE and at most 1 meaning that there will be two cointegration equation.

4.4.2 Commercial Banks Sector

Table 4.24: Trace Statistics

	Hypothesis	Eigen-value	T-Statistics	Critical Value 5%	Remarks
BAFL	None *	0.125	201.884	12.321	1 Cointegration Equation
	At most 1	0.001	0.970	4.130	
BOP	None *	0.139	214.290	12.321	1 Cointegration Equation
	At most 1	0.001	1.409	4.130	
FABL	None *	0.077	71.511	18.398	1 Cointegration Equation
	At most 1	0.002	2.032	3.841	
AKBL	None *	0.316	220.506	20.262	1 Cointegration Equation
	At most 1	0.005	2.968	9.165	
UBL	None *	0.254	261.220	18.398	2 Cointegration Equation
	At most 1 *	0.012	10.141	3.841	
HBL	None *	0.350	242.079	20.262	1 Cointegration Equation
	At most 1	0.006	3.396	9.165	

Table 4.25: Max-Eigen Statistics

	Hypothesis	Eigen-value	MaxEigen Value	Critical Value 5%	Remarks
BAFL	None *	0.125	200.914	11.225	1 Cointegration Equation
	At most 1	0.001	0.970	4.130	
BOP	None *	0.139	212.880	11.225	1 Cointegration Equation
	At most 1	0.001	1.409	4.130	
FABL	None *	0.077	69.479	17.148	1 Cointegration Equation
	At most 1	0.002	2.032	3.841	
AKBL	None *	0.316	217.538	15.892	1 Cointegration Equation
	At most 1	0.005	2.968	9.165	
UBL	None *	0.254	251.079	17.148	2 Cointegration Equation
	At most 1 *	0.012	10.141	3.841	
HBL	None *	0.350	238.683	15.892	1 Cointegration Equation
	At most 1	0.006	3.396	9.165	

In the above tables the results shows that there is one cointegration equation for all companies as their critical value is less than its Trace statistics values for NONE except for one company in which there is two cointegration equation as it both critical value for NONE as well as At most 1 is less than its Trace and Max-Eigen value. So BAFL, BOP, FABL, AKBL and HBL has one cointegration equation and UBL has two cointegration equation.

4.4.3 Cement Sector

Table 4.26: Trace Statistics

	Hypothesis	Eigen-value	T-Statistics	Critical Value 5%	Remarks
DGKC	None *	0.128	325.561	12.321	1 Cointegration Equation
	At most 1	0.000	0.264	4.130	
FCCL	None *	0.352	323.378	20.262	1 Cointegration Equation
	At most 1	0.007	4.972	9.165	
POWER	None *	0.337	229.917	20.262	1 Cointegration Equation
	At most 1	0.004	2.249	9.165	

Table 4.27: Max-Eigen statistics

	Hypothesis	Eigen-value	MaxEigen Value	Critical Value 5%	Remarks
DGKC	None *	0.128	325.297	11.225	1 Cointegration Equation
	At most 1	0.000	0.264	4.130	
FCCL	None *	0.352	318.406	15.892	1 Cointegration Equation
	At most 1	0.007	4.972	9.165	
POWER	None *	0.337	227.668	15.892	1 Cointegration Equation
	At most 1	0.004	2.249	9.165	

All three companies, DGKC, FCCL and POWER of both trace and Max-Eigen has one cointegration equation as critical value of only NONE is less than its trace and Max-Eigen statistics meaning that all three companies have one cointegration equation. While the critical value of at most 1 is greater than that of its trace and Max-Eigen statistics.

4.4.4 Refinery Sector

Table 4.28: Trace Statistics:

	Hypothesis	Eigen-value	T-Statistics	Critical Value 5%	Remarks
ATRL	None *	0.352	242.257	20.262	1 Cointegration Equation
	At most 1	0.004	2.310	9.165	
CNERGY	None *	0.354	308.106	20.262	1 Cointegration Equation
	At most 1	0.006	4.034	9.165	

Table 4.29: Max-Eigen Statistics

	Hypothesis	Eigen-value	MaxEigen Value	Critical Value 5%	Remarks
ATRL	None *	0.352	239.948	15.892	1 Cointegration Equation
	At most 1	0.004	2.310	9.165	
CNERGY	None *	0.354	304.073	15.892	1 Cointegration Equation
	At most 1	0.006	4.034	9.165	

Both ATRL and CNERGY has one cointegration equation as critical value of only NONE is less than its trace and Max-Eigen statistics meaning that both companies have one cointegration equation. While the critical value of at most 1 is greater than that of its trace and Max-Eigen statistics.

4.4.5 Textile Sector

Table 4.30: Trace Statistics

	Hypothesis	Eigen-value	T-Statistics	Critical Value 5%	Remarks
GATM	None *	0.326	308.583	20.262	1 Cointegration Equation
	At most 1	0.003	2.314	9.165	
NCL	None *	0.346	396.353	20.262	1 Cointegration Equation
	At most 1	0.005	4.231	9.165	
NML	None *	0.291	239.019	20.262	1 Cointegration Equation
	At most 1	0.006	3.828	9.165	

Table 4.31: Max-Eigen Statistics

	Hypothesis	Eigen-value	MaxEigen Value	Critical Value 5%	Remarks
GATM	None *	0.326	306.270	15.892	1 Cointegration Equation
	At most 1	0.003	2.314	9.165	
NCL	None *	0.346	392.123	15.892	1 Cointegration Equation
	At most 1	0.005	4.231	9.165	
NML	None *	0.291	235.191	15.892	1 Cointegration Equation
	At most 1	0.006	3.828	9.165	

All three GATM, NCL and NML has one cointegration equation as critical value of only NONE is less than its trace and Max-Eigen statistics meaning that all three companies have one cointegration equation. While the critical value of at most 1 is greater than that of its trace and Max-Eigen statistics.

4.4.6 Oil and gas Sector

Table 4.32: Trace Statistics

	Hypothesis	Eigen-value	T-Statistics	Critical Value 5%	Remarks
PSO	None *	0.316	133.704	20.262	1 Cointegration Equation
	At most 1	0.005	1.768	9.165	
PPL	None *	0.332	226.765	20.262	1 Cointegration Equation
	At most 1	0.006	3.251	9.165	
OGDC	None *	0.354	245.298	20.262	1 Cointegration Equation
	At most 1	0.007	3.650	9.165	

Table 4.33: Max-Eigen Statistics

	Hypothesis	Eigen-value	MaxEigen Value	Critical Value 5%	Remarks
PSO	None *	0.316	131.936	15.892	1 Cointegration Equation
	At most 1	0.005	1.768	9.165	
PPL	None *	0.332	223.514	15.892	1 Cointegration Equation
	At most 1	0.006	3.251	9.165	
OGDC	None *	0.354	241.649	15.892	1 Cointegration Equation
	At most 1	0.007	3.650	9.165	

All three PSO, PPL and OGDC has one cointegration equation as critical value of only NONE is less than its trace and Max-Eigen statistics meaning that all three companies have one cointegration equation. While the critical value of at most 1 is greater than that of its trace and Max-Eigen statistics.

4.4.7 Power Generation and Distribution, Technology and Communication, Cable & Electrical Goods, Synthetic & Rayon Sectors

Table 4.34: Trace Statistics

	Hypothesis	Eigen-value	T-Statistics	Critical Value 5%	Remarks
HUBC	None *	0.333	383.229	20.262	2 Cointegration Equation
	At most 1 *	0.011	9.844	9.165	
TRG	None *	0.338	382.140	18.398	1 Cointegration Equation
	At most 1	0.001	1.165	3.841	
PAEL	None *	0.354	335.294	20.262	1 Cointegration Equation
	At most 1	0.005	3.534	9.165	
DSFL	None *	0.344	567.935	25.872	1 Cointegration Equation
	At most 1	0.006	7.834	12.518	

Table 4.35: Max-Eigen Statistics

	Hypothesis	Eigen-value	MaxEigen Value	Critical Value 5%	Remarks
HUBC	None *	0.333	373.384	15.892	2 Cointegration Equation
	At most 1 *	0.011	9.844	9.165	
TRG	None *	0.338	380.975	17.148	1 Cointegration Equation
	At most 1	0.001	1.165	3.841	
PAEL	None *	0.354	331.760	15.892	1 Cointegration Equation
	At most 1	0.005	3.534	9.165	
DSFL	None *	0.344	560.100	19.387	1 Cointegration Equation
	At most 1	0.006	7.834	12.518	

All three TRG, PAEL and DSFL has one cointegration equation as critical value of only NONE is less than its trace and Max-Eigen statistics meaning that all three companies have one cointegration equation. While the critical value of at most 1 is greater than that of its trace and Max-Eigen

statistics. But for HUBC both critical values of NONE and at most 1 is less than its corresponding trace and Max-Eigen statistics meaning that HUBC has two cointegration equation.

4.5 Variance Decomposition

4.5.1 Fertilizer Sector

Table 4.36: Variance Decomposition of SR (EFERT, ENGRO, FFBL, FFC):

	Variance Decomposition of SR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
EFERT	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.87	99.62	99.59	99.58	99.58	99.57	99.57	99.57	99.57
	FR	0.00	0.13	0.38	0.41	0.42	0.42	0.43	0.43	0.43	0.43
ENGRO	S.E.	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.05	0.05
	SR	100.00	99.79	99.69	99.72	99.73	99.70	99.69	99.69	99.69	99.69
	FR	0.00	0.21	0.31	0.28	0.27	0.30	0.31	0.31	0.31	0.31
FFBL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	56.04	56.37	56.36	56.36	56.36	56.36	56.36	56.36	56.36	56.36
	FR	43.96	43.63	43.64	43.64	43.64	43.64	43.64	43.64	43.64	43.64
FFC	S.E.	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	94.20	89.25	83.89	81.37	78.89	76.59	74.85	73.29	71.92
	FR	0.00	5.80	10.75	16.11	18.63	21.11	23.41	25.15	26.71	28.08

Table 4.37: Variance Decomposition of FR (EFERT, ENGRO, FFBL, FFC):

	Variance Decomposition of FR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
EFERT	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	23.97	18.48	19.62	19.48	19.33	19.34	19.34	19.34	19.34	19.34
	FR	76.03	81.52	80.38	80.52	80.67	80.66	80.66	80.66	80.66	80.66
ENGRO	S.E.	0.09	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12
	SR	6.61	5.61	6.13	8.17	9.06	10.06	11.24	12.29	13.31	14.35
	FR	93.39	94.39	93.87	91.83	90.94	89.94	88.76	87.71	86.69	85.65
FFBL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	43.96	43.63	43.64	43.64	43.64	43.64	43.64	43.64	43.64	43.64
	FR	56.04	56.37	56.36	56.36	56.36	56.36	56.36	56.36	56.36	56.36
FFC	S.E.	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04
	SR	30.83	33.88	35.93	39.67	41.03	42.15	43.32	44.12	44.80	45.41
	FR	69.17	66.12	64.07	60.33	58.97	57.85	56.68	55.88	55.20	54.59

Variance Decomposition of SR

The data for variance decomposition for spot return shows that the variation in spot returns for EFERT and ENGRO is mainly explains by spot returns itself. i.e., the variation in SR for period 1 is 100% explain by SR and 0% by FR for EFERT and ENGRO. Up to 10 period the effect of variation in SR in 99% is explained by SR in EFERT and ENGRO. The story is different for FFBL in which we can see that the effect is variation in SR is only 56% explain by SR and 43% is explained by FR in its first period. The same story goes to remaining 9 periods. In FFC, the variation in SR is 100% is explained by SR which decrease to 71% at 10^{th} period.

Variance Decomposition of FR

The data for variance decomposition for FR is shown in the table. The data conclude that the variation in FR is mainly explained by FR in all companies. The intensity differs from 56% in FFBL, 69% in FFC, 76% in EFERTS to 93% in ENGRO.

4.5.2 Commercial Banks Sector

Table 4.38: Variance Decomposition of SR (BAFL, BOP, FABL, AKBL, UBL, HBL):

	Variance Decomposition of SR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
BAFL	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	100.00	98.32	98.26	98.23	98.23	98.23	98.23	98.23	98.23	98.23
	FR	0.00	1.68	1.74	1.77	1.77	1.77	1.77	1.77	1.77	1.77
BOP	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	100.00	97.84	97.81	97.76	97.75	97.75	97.75	97.75	97.75	97.75
	FR	0.00	2.16	2.19	2.24	2.25	2.25	2.25	2.25	2.25	2.25
FABL	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	91.13	90.90	90.28	90.26	90.23	90.22	90.22	90.22	90.22
	FR	0.00	8.87	9.10	9.72	9.74	9.77	9.78	9.78	9.78	9.78
AKBL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.96	99.83	99.81	99.81	99.80	99.80	99.80	99.80	99.80
	FR	0.00	0.04	0.17	0.19	0.19	0.20	0.20	0.20	0.20	0.20
UBL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.84	99.75	99.69	99.68	99.68	99.68	99.67	99.67	99.67
	FR	0.00	0.16	0.25	0.31	0.32	0.32	0.32	0.33	0.33	0.33
HBL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.98	99.86	99.84	99.84	99.83	99.83	99.83	99.83	99.83
	FR	0.00	0.02	0.14	0.16	0.16	0.17	0.17	0.17	0.17	0.17

Table 4.39: Variance Decomposition of FR(BAFL, BOP, FABL, AKBL, UBL, HBL):

	Variance Decomposition of FR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
BAFL	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	56.25	56.03	56.03	56.02	56.02	56.02	56.02	56.02	56.02	56.02
	FR	43.75	43.97	43.97	43.98	43.98	43.98	43.98	43.98	43.98	43.98
BOP	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	63.47	63.15	63.05	63.01	63.01	63.01	63.01	63.01	63.01	63.01
	FR	36.53	36.85	36.95	36.99	36.99	36.99	36.99	36.99	36.99	36.99
FABL	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	49.04	48.98	48.69	48.62	48.62	48.61	48.61	48.61	48.61	48.61
	FR	50.96	51.02	51.31	51.38	51.38	51.39	51.39	51.39	51.39	51.39
AKBL	S.E.	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	SR	11.00	7.86	7.83	7.65	7.52	7.51	7.51	7.50	7.50	7.50
	FR	89.00	92.14	92.17	92.35	92.48	92.49	92.49	92.50	92.50	92.50
UBL	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	26.51	19.51	19.07	19.00	18.80	18.74	18.74	18.74	18.73	18.73
	FR	73.49	80.49	80.93	81.00	81.20	81.26	81.26	81.26	81.27	81.27
HBL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	96.53	94.76	94.54	94.50	94.40	94.39	94.38	94.38	94.38	94.38
	FR	3.47	5.24	5.46	5.50	5.60	5.61	5.62	5.62	5.62	5.62

Variance Decomposition of SR

The data for variance decomposition for SR shows that the variance in SR is mainly explained by SR and slightly explained by FR. In first period the variation is explained 100% by SR and 0% explained by FR, the behavior of all companies in above mentioned table is same.

Variance Decomposition of FR

The data for variance decomposition of FR shows that the variation in FR is mainly explained by FR only in AKBL and UBL which is 89% and 73% in first period, respectively. In FABL it is 50% explained by FR and 50% by SR. while in BAFL and BOP, the variation in FR is explained 56% and 63% by SR and 43% and 36% by SR, respectively. The story is somewhat extreme in case of HBL in which the variation in FR is explained 96% by SR and only 3% by FR.

4.5.3 Cement Sector

Table 4.40: Variance Decomposition of SR (DGKC, FCCL, POWER):

	Variance Decomposition of SR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
DGKC	S.E.	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	96.18	96.12	95.96	95.95	95.95	95.95	95.95	95.95	95.95
	FR	0.00	3.82	3.88	4.04	4.05	4.05	4.05	4.05	4.05	4.05
FCCL	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	99.97	99.86	99.84	99.84	99.84	99.83	99.83	99.83	99.83
	FR	0.00	0.03	0.14	0.16	0.16	0.16	0.17	0.17	0.17	0.17
POWER	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	99.58	99.41	99.39	99.39	99.38	99.38	99.38	99.38	99.38
	FR	0.00	0.42	0.59	0.61	0.61	0.62	0.62	0.62	0.62	0.62

Table 4.41: Variance Decomposition of FR (DGKC, FCCL, POWER):

	Variance Decomposition of FR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
DGKC	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	56.49	56.35	56.47	56.45	56.45	56.45	56.45	56.45	56.45	56.45
	FR	43.51	43.65	43.53	43.55	43.55	43.55	43.55	43.55	43.55	43.55
FCCL	S.E.	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	SR	14.66	10.45	10.47	10.34	10.18	10.15	10.15	10.15	10.14	10.14
	FR	85.34	89.55	89.53	89.66	89.82	89.85	89.85	89.85	89.86	89.86
POWER	S.E.	0.09	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	SR	7.76	5.16	5.03	5.00	4.94	4.93	4.93	4.93	4.93	4.92
	FR	92.24	94.84	94.97	95.00	95.06	95.07	95.07	95.07	95.07	95.08

Variance Decomposition of SR

The data for variance decomposition for SR shows that the variance in SR is mainly explained by SR and slightly explained by FR. In first period the variation is explained 100% by SR and 0% explained by FR. The behavior of all companies in above mentioned table is same.

Variance Decomposition of FR

The data for variance decomposition of FR shows that the variation in FR is explained in DGKC by SR of up to 56% in first period. This intensity is same through out of up to ten periods. In the remaining two companies, FCCL and POWER, the variation in FR is mainly explained by FR of 85% and 92% respectively.

4.5.4 Refinery Sector

Table 4.42: Variance Decomposition of SR (ATRL, CYNERGY):

	Variance Decomposition of SR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
ATRL	S.E.	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	100.00	99.99	99.97	99.95	99.95	99.94	99.94	99.94	99.94	99.94
	FR	0.00	0.01	0.03	0.05	0.05	0.06	0.06	0.06	0.06	0.06
CNERGY	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	99.92	99.91	99.88	99.87	99.87	99.87	99.87	99.87	99.87
	FR	0.00	0.08	0.09	0.12	0.13	0.13	0.13	0.13	0.13	0.13

Table 4.43: Variance Decomposition of FR (ATRL, CYNERGY):

	Variance Decomposition of FR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
ATRL	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	89.24	83.73	83.65	83.35	83.02	82.96	82.96	82.95	82.94	82.94
	FR	10.76	16.27	16.35	16.65	16.98	17.04	17.04	17.05	17.06	17.06
CNERGY	S.E.	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	SR	12.15	8.84	8.71	8.68	8.59	8.58	8.58	8.58	8.58	8.58
	FR	87.85	91.16	91.29	91.32	91.41	91.42	91.42	91.42	91.42	91.42

Variance Decomposition of SR

The data for variance decomposition for SR shows that the variance in SR is mainly explained by SR and slightly explained by FR. In first period the variation is explained 100% by SR and 0% explained by FR. The behavior of both companies in above mentioned table is same.

Variance Decomposition of FR

In the above table, the data for variance decomposition for FR shows that the variation if FR is mainly explained by SR by 87% in first period for ATRL and decreased to 82% in 10th period. For CNERGY, the, the variation in FR is mainly explained by FR by 87% in first period and increased to 91% in 10th period.

4.5.5 Textile Sector

Table 4.44: Variance Decomposition of SR (GATM, NCL, NML):

	Variance Decomposition of SR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
GATM	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	99.99	99.88	99.85	99.85	99.84	99.84	99.84	99.84	99.84
	FR	0.00	0.01	0.12	0.15	0.15	0.16	0.16	0.16	0.16	0.16
NCL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.86	99.72	99.71	99.70	99.70	99.70	99.70	99.70	99.70
	FR	0.00	0.14	0.28	0.29	0.30	0.30	0.30	0.30	0.30	0.30
NML	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	99.95	99.95	99.95	99.95	99.95	99.95	99.95	99.95	99.95
	FR	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Table 4.45: Variance Decomposition of FR (GATM, NCL, NML):

	Variance Decomposition of FR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
GATM	S.E.	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	SR	16.41	12.29	12.28	12.11	11.99	11.98	11.98	11.97	11.97	11.97
	FR	83.59	87.71	87.72	87.89	88.01	88.02	88.02	88.03	88.03	88.03
NCL	S.E.	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	SR	14.15	10.03	10.05	9.96	9.86	9.86	9.86	9.85	9.85	9.85
	FR	85.85	89.97	89.95	90.04	90.14	90.14	90.14	90.15	90.15	90.15
NML	S.E.	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	50.99	41.92	41.27	41.24	41.08	41.03	41.03	41.03	41.03	41.03
	FR	49.01	58.08	58.73	58.76	58.92	58.97	58.97	58.97	58.97	58.97

Variance Decomposition of SR

The data for variance decomposition for SR shows that the variance in SR is mainly explained by SR and slightly explained by FR. In first period the variation is explained 100% by SR and 0% explained by FR. The behavior of both companies in above mentioned table is same.

Variance Decomposition of FR

The data for variance decomposition of FR shows that the variation in FR is explained in NML by SR of up to 51% in first period which decreased to 41% in 10th period. In the remaining two companies, GATM and NCL, the variation in FR is mainly explained by FR of 83% and 85% which increased to 88% and 90% in tenth period, respectively.

4.5.6 Oil and Gas Sector

Table 4.46: Variance Decomposition of SR (PSO, PPL, OGDC):

	Variance Decomposition of SR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PSO	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.92	99.92	99.91	99.91	99.91	99.91	99.91	99.91	99.91
	FR	0.00	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09
PPL	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.99	99.78	99.66	99.65	99.65	99.64	99.64	99.64	99.64
	FR	0.00	0.01	0.22	0.34	0.35	0.35	0.36	0.36	0.36	0.36
OGDC	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.71	99.59	99.46	99.45	99.45	99.44	99.44	99.44	99.44
	FR	0.00	0.29	0.41	0.54	0.55	0.55	0.56	0.56	0.56	0.56

Table 4.47: Variance Decomposition of FR (PSO, PPL, OGDC)

	Variance Decomposition of FR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PSO	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	92.25	89.93	89.33	89.16	89.11	89.09	89.09	89.09	89.09	89.09
	FR	7.75	10.07	10.67	10.84	10.89	10.91	10.91	10.91	10.91	10.91
PPL	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	73.93	63.18	62.73	62.41	61.93	61.81	61.81	61.79	61.78	61.78
	FR	26.07	36.82	37.27	37.59	38.07	38.19	38.19	38.21	38.22	38.22
OGDC	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	55.25	47.78	47.44	47.18	46.88	46.84	46.84	46.83	46.83	46.83
	FR	44.75	52.22	52.56	52.82	53.12	53.16	53.16	53.17	53.17	53.17

Variance Decomposition of SR

The data for variance decomposition for SR shows that the variance in SR is mainly explained by SR and slightly explained by FR. In first period the variation is explained 100% by SR and 0% explained by FR. The behavior of both companies in above mentioned table is same.

Variance Decomposition of FR

The data for variance decomposition of FR shows that the variation in FR is explained in PSO is mainly explained by SR of 92% in first period which decreased to 89% to 10^{th} period. Moreover, in PPL and OGDC, the variation in FR is also explained by SR but the intensity is lowered to 73% and 55% respectively.

4.5.7 Power Generation and Distribution, Technology and Communication, Cable & Electrical Goods, Synthetic & Rayon Sectors

Table 4.48: Variance Decomposition of SR (HUBC TRG PAEL DSFL):

	Variance Decomposition of SR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
HUBC	S.E.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	SR	100.00	99.89	99.65	99.51	99.51	99.50	99.49	99.49	99.49	99.49
	FR	0.00	0.11	0.35	0.49	0.49	0.50	0.51	0.51	0.51	0.51
TRG	S.E.	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	SR	100.00	99.80	99.15	99.06	99.06	99.05	99.04	99.04	99.04	99.04
	FR	0.00	0.20	0.85	0.94	0.94	0.95	0.96	0.96	0.96	0.96
PAEL	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	99.63	99.63	99.61	99.60	99.60	99.60	99.60	99.60	99.60
	FR	0.00	0.37	0.37	0.39	0.40	0.40	0.40	0.40	0.40	0.40
DSFL	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	100.00	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
	FR	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Table 4.49: Variance Decomposition of FR (HUBC TRG PAEL DSFL):

	Variance Decomposition of FR										
	Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
HUBC	S.E.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	SR	46.40	38.55	38.58	37.84	37.60	37.62	37.60	37.59	37.59	37.58
	FR	53.60	61.45	61.42	62.16	62.40	62.38	62.40	62.41	62.41	62.42
TRG	S.E.	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	SR	29.67	22.88	22.65	22.55	22.42	22.41	22.41	22.41	22.41	22.41
	FR	70.33	77.12	77.35	77.45	77.58	77.59	77.59	77.59	77.59	77.59
PAEL	S.E.	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	SR	21.16	15.44	15.42	15.25	15.10	15.08	15.08	15.08	15.07	15.07
	FR	78.84	84.56	84.58	84.75	84.90	84.92	84.92	84.92	84.93	84.93
DSFL	S.E.	0.15	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
	SR	3.30	2.40	2.48	2.44	2.42	2.41	2.41	2.41	2.41	2.41
	FR	96.70	97.60	97.52	97.56	97.58	97.59	97.59	97.59	97.59	97.59

Variance Decomposition of SR

The data for variance decomposition for SR shows that the variance in SR is mainly explained by SR and slightly explained by FR. In first period the variation is explained 100% by SR and 0% explained by FR. The behavior of both companies in above mentioned table is same.

Variance Decomposition of FR

The data for variance decomposition of FR shows that the variation in FR is explained in HUBC, TRG, PAEL, and DSFL is mainly explained by FR by 53%, 70%, 78% and 96% in first period which increases to 62%, 77% 84% and 97% in tenth period, respectively.

4.6 Impulse Response

4.6.1 Fertilizer

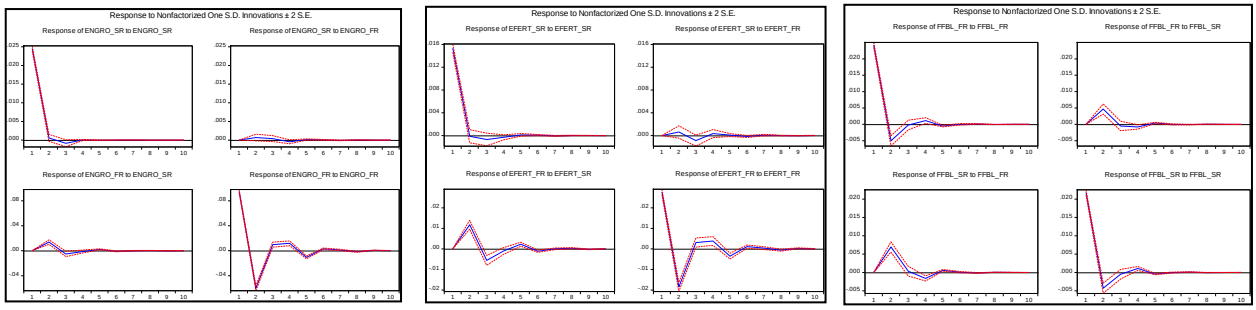

Figure 4.1: Impulse response of EFERT (left), ENGRO (center) and FFBL (right)

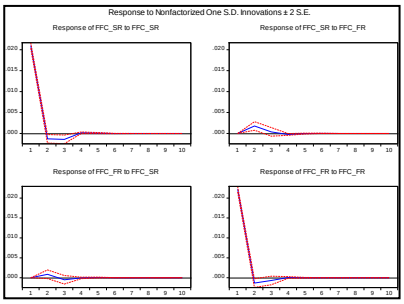

Figure 4.2: Impulse response of FFC

4.6.2 Commercial Banks

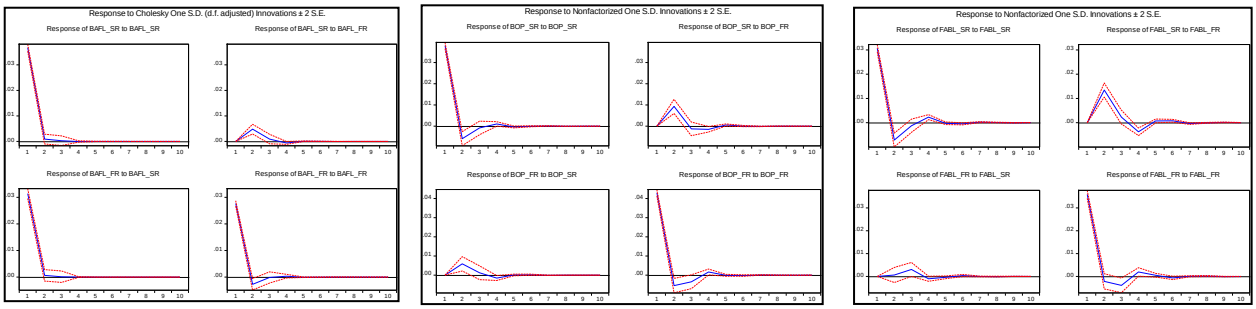

Figure 4.3: Impulse response of BAFL (left), BOP (center) and FABL (right)

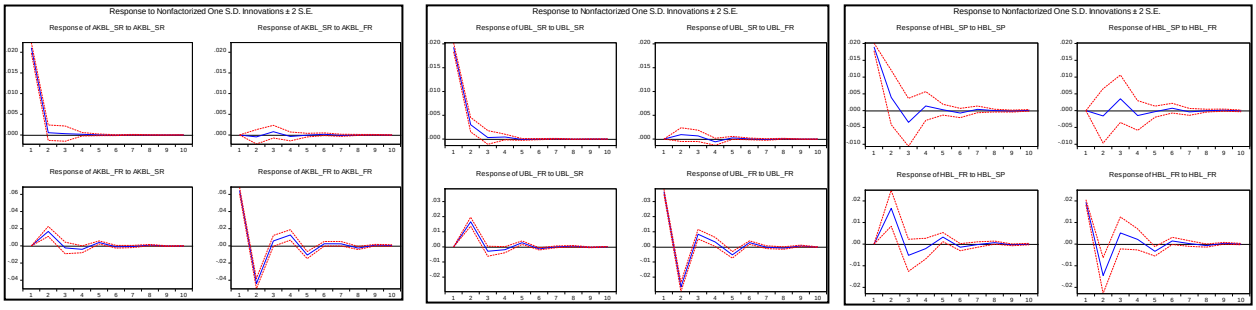

Figure 4.4: Impulse response of AKBL (left), UBL (center) and HBL (right)

4.6.3 Cement

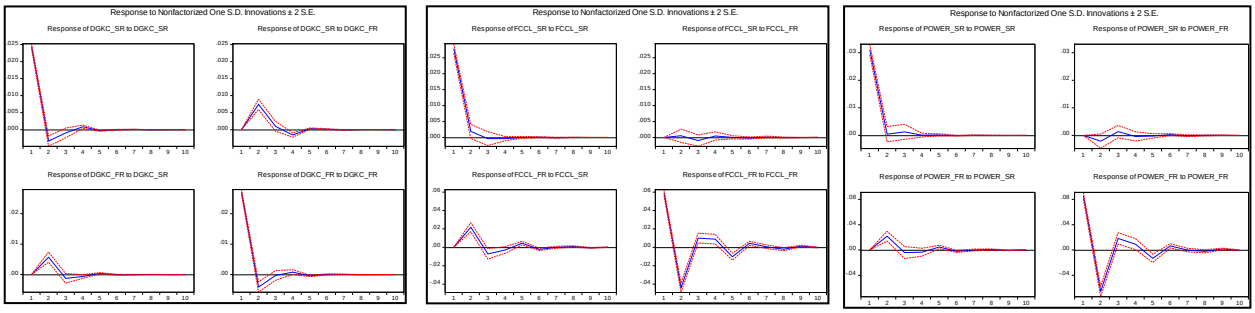

Figure 4.5: Impulse response of DGKC (left), FCCL (center) and POWER (right)

4.6.4 Refinery

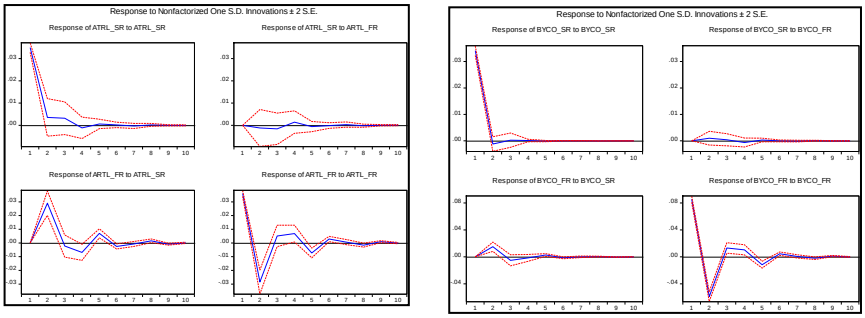

Figure 4.6: Impulse response of ATRL (left) and CNERGY (right)

4.6.5 Textile

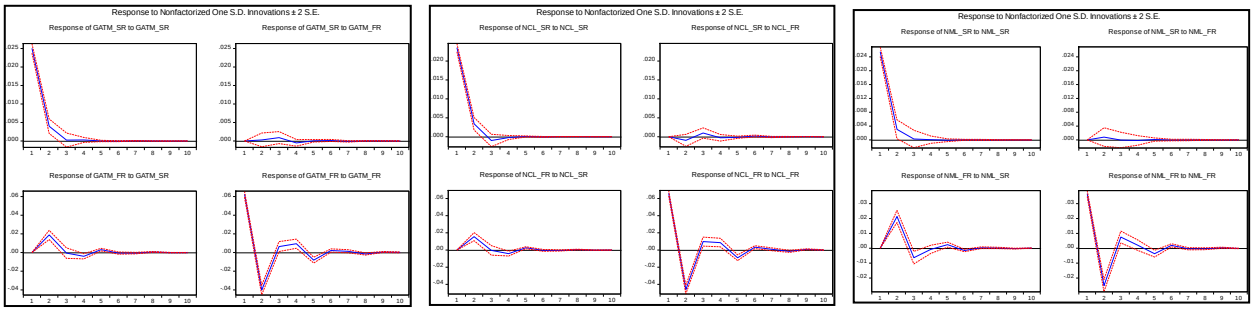

Figure 4.7: Impulse response of GATM (left), NCL (center) and NML (right)

4.6.6 Oil and gas

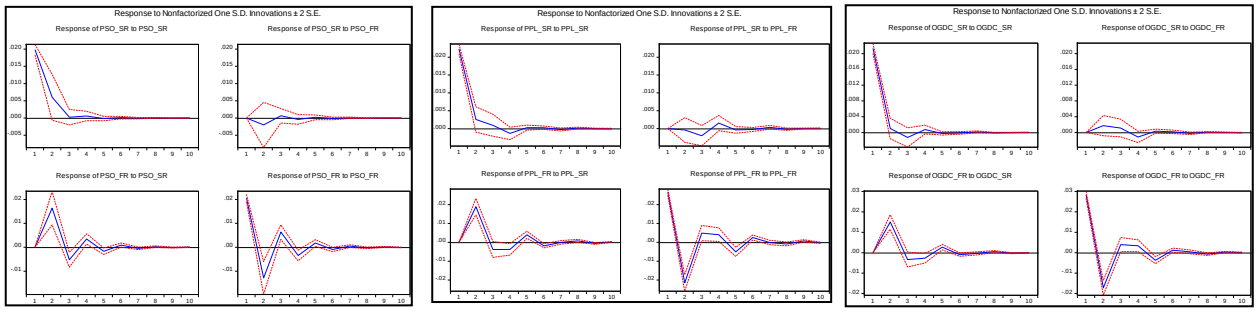

Figure 4.8: Impulse response of PSO (left), PPL (center) and OGDC (right)

4.6.7 Power Generation and Distribution, Technology and Communication, Cable, and Electrical Goods and Synthetic and Rayon

HUBC

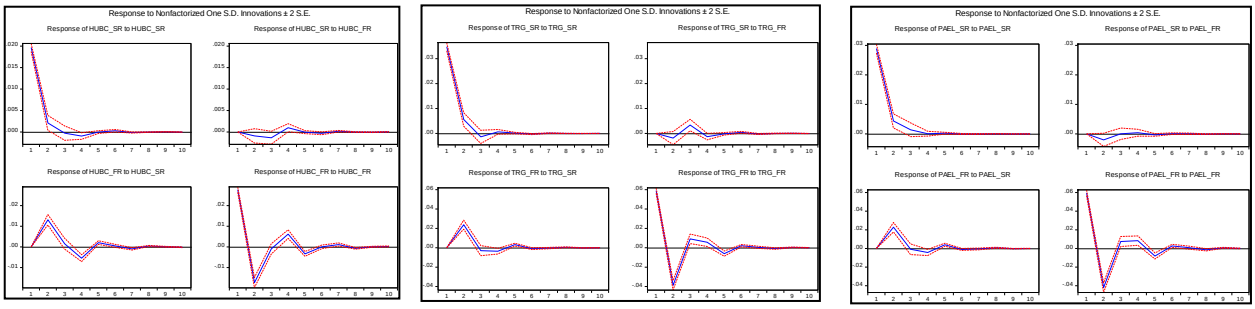

Figure 4.9: Impulse response of HUBC (left), TRG (center) and PAEL (right)

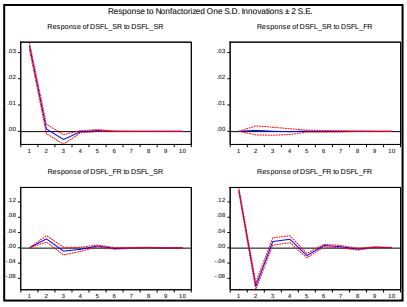

Figure 4.10: Impulse response of DSFL

Interpretation:

Impulse response is a good and efficient way in econometrics through which we can analyze the effect of shock of in a variable. This technique makes it extremely useful to assist in economic policies. In this study, all companies have almost same response to one standard deviation shock. Most of companies effect last for only five periods and none of the companies' shock stays more than ten periods.

4.7 Vector Error Correction Model:

Table 4.50: Vector Error Correction Model Result

Company	ECT	Coefficient	PROB
BAHL	ECT	-1.061547	0.0000
BOP	ECT	-0.511004	0.0000
DGKC	ECT	-0.926122	0.0000
DSFL	ECT	-2.31013	0.0000
ENGRO	ECT	-1.138956	0.0000
FABL	ECT	-0.690578	0.0000
FFBL	ECT	-0.701046	0.0000
FFC	ECT	-0.138073	0.0000
ATRL	ECT	-0.954501	0.0058
UBL	ECT	-0.661044	0.0015
BYCO	ECT	-0.134046	0.0017
HBL	ECT	-0.15875	0.0000
PSO	ECT	-0.995371	0.0071
AKBL	ECT	-0.076959	0.0000
PPL	ECT	-0.063745	0.0001
FCCL	ECT	-0.042675	0.0000
NCL	ECT	-0.131812	0.0192
NML	ECT	-0.18026	0.0000
OGDC	ECT	-0.175519	0.0078
POWER	ECT	-0.197968	0.0147
EFERT	ECT	-0.277386	0.0000
HUBC	ECT	-1.430389	0.0024
TRG	ECT	-0.964114	0.0000
PAEL	ECT	-0.079495	0.0001
GATM	ECT	-0.077772	0.0000

From the above table we can see that the error correction term (ECT) is negative and statistically significant meaning that the probability value is less than 5%. DSFL has a high speed of Adjustment of 231% meaning that previous month disequilibrium will be corrected with 231% in current month. The lowest speed of adjustment is 6.3% for PPL.

4.8 Granger Causality

Granger causality is most widely used technique to find the causality between variables. The null hypothesis for granger causality test is "variable one does not granger cause Variable two" while the alternate hypothesis is "variable one does granger cause variable two." The hypothesis can be tested by F-Statistics and his probability if the probability value is less than 5% then we will reject null hypothesis and accept alternate hypothesis meaning that there exists causality between variables.

Table 4.51: Granger Causality Test of Fertilizer Sector

Null Hypothesis:	Obs	F-Statistic	Prob.
EFERT FR does not GC EFERT SR	922	2.07	0.1267
EFERT SR does not GC EFERT FR		64.31	0.0000
ENGRO FR does not GC ENGRO SR	2850	1.91	0.1485
ENGRO SR does not GC ENGRO FR		30.93	0.0000
FFBL SR does not GC FFBL FR	2157	18.45	0.0000
FFBL FR does not GC FFBL SR		50.83	0.0000
FFC FR does not GC FFC SR	2151	6.44	0.0016
FFC SR does not GC FFC FR		1.69	0.1843

In the table above, the probability value for null hypothesis for FR does not GC SR for both companies EFERT and Engro is greater than 5%. So, we will accept null hypothesis meaning that future return does not cause spot return in both companies. But the probability value of null hypothesis SR does not GC FR for EFERT and ENGRO is less than 5%. So, we will reject the null hypothesis meaning that the SR does not cause FR in these two companies. Both null hypothesis of FR to SR and SR to FR for FFBL, the probability value is less than 5% which means that we will reject both null hypotheses meaning that both SR and FR cause each other. For FFC we reject null hypotheses of FR does not cause SR as its probability value is less than 5% and accept null hypotheses of SR does no cause FR as its probability value is greater than 5%.

We conclude that there is one way causality from SR to FR in EFERT and ENGRO and one way causality from FR to SR in FFC. And there is two-way causality in FFBL.

Table 4.52: Granger Causality Test of Commercial Banks Sector

Null Hypothesis:	Obs	F-Statistic	Prob.
BAFL FR does not GC BAFL SR	1507	13.44	0.0000
BAFL SR does not GC BAFL FR		2.66	0.0702
BOP FR does not GC BOP SR	1420	16.32	0.0000
BOP SR does not GC BOP FR		5.29	0.0051
FABL FR does not GC FABL SR	864	46.26	0.0000
FABL SR does not GC FABL FR		2.25	0.1063
AKBL FR does not GC AKBL SR	573	0.58	0.5602
AKBL SR does not GC AKBL FR		21.33	0.0000
UBL FR does not GC UBL SR	859	1.46	0.2322
UBL SR does not GC UBL FR		79.12	0.0000
HBL FR does not GC HBL SP	554	0.55	0.5758
HBL SR does not GC HBL FR		8.53	0.0002

In this sector of commercial bank, the null hypothesis of FR does not cause SR of BAFL and FABL is rejected because its probability value is less than 5% meaning that FR of BAFL and FABL does cause SR of same its own company. We can also see that the probability value for null hypothesis SR does not cause FR is greater than 5% for BAFL and FABL so we accept null hypotheses which means that the SR of these companies does not cause FR of its own. Similarly, for AKBL, UBL and HBL, the null hypotheses of FR do not cause SR is accepted as its probability value is greater than 5% meaning that FR of AKBL, UBL and HBL does not cause SR of its own company. The probability value of null hypotheses of SR does not cause FR of AKBL, UBL and HBL is less than 5% which means the null hypotheses must be rejected and the SR of these companies does cause FR of its own company. For BOP both null hypotheses of FR do not cause SR and SR does not cause FR is rejected as their probability values are less than 5% which means that both FR and SR cause each other. We conclude from the result that there is one way causality from FR to SR in BAFL and FABL and one way causality from SR to FR in AKBL, UBL and HBL and two-way causality BOP.

Table 4.53: Granger Causality Test of Cement Sector

Null Hypothesis:	Obs	F-Statistic	Prob.
DGKC FR does not GC DGKC SR	2379	49.77	0.0000
DGKC SR does not GC DGKC FR		24.48	0.0000
FCCL FR does not GC FCCL SR	735	0.68	0.5053
FCCL SR does not GC FCCL FR		47.07	0.0000
POWER FR does not GC POWER SR	554	1.69	0.1849
POWER SR does not GC POWER FR		21.03	0.0000

In the above table of Granger Causality, the null hypotheses of FR do not cause SR for both FCCL, and POWER is accepted as the probability value is greater than 5% which means that FR does not cause SR of FCCL and POWER. While the null hypotheses of SR do not cause FR of these companies is rejected as their probability value is less than 5% which means that the SR of do cause FR of FCCL and POWER. For DGKC both null hypotheses of FR do not cause SR and SR do not cause FR is rejected as their probability value is less than 5% which means that both SR and FR does cause each other. We conclude that there is two-way causality in DGKC ad one way causality in FCCL and POWER from SR to FR.

Table 4.54: Granger Causality Test of Refinery Sector

Null Hypothesis:	Obs	F-Statistic	Prob.
ARTL FR does not GC ATRL SR	554	0.17	0.8433
ATRL SR does not GC ARTL FR		22.73	0.0000
CYNERGY FR does not GC CYNERGY SR	696	0.46	0.6346
CYNERGY SR does not GC CYNERGY FR		10.67	0.0000

The Granger Causality of ATRL and CYNERGY shows that both one way causality from SR to FR as the probability value of null hypotheses of SR do no cause FR is less than 5% so we reject null hypotheses and accept alternate hypotheses. The probability value FR do cause SR is greater than 5% for both ATRL and CYNERGY so we accept null hypotheses which means that FR of ATRL and CYNERGY do not cause SR of its own company.

Table 4.55: Granger Causality Test of Textile Sector

Null Hypothesis:	Obs	F-Statistic	Prob.
GATM FR does not GC GATM SR	777	0.68	0.5055
GATM SR does not GC GATM FR		38.88	0.0000
NCL FR does not GC NCL SR	922	1.68	0.1863
NCL SR does not GC NCL FR		30.45	0.0000
NML FR does not GC NML SR	683	0.19	0.8298
NML SR does not GC NML FR		59.42	0.0000

One way causality can be seen in GATM, NCL and NML from SR to FR as their probability of null hypotheses is less than 5% so we reject null hypotheses and accept alternate hypotheses of there is causality from FR SR to FR. The probability value of null hypotheses FR do not cause SR for GATM, NCL and NML is greater than 5% so we accept null hypotheses which means that FR do no cause SR on its own company.

Table 4.56: Granger Causality Test of Oil and gas Sector

Null Hypothesis:	Obs	F-Statistic	Prob.
PSO FR does not GC PSO SR	348	1.49	0.2273
PSO SR does not GC PSO FR		12.39	0.0000
PPL FR does not GC PPL SR	555	1.11	0.3311
PPL SR does not GC PPL FR		41.18	0.0000
OGDC FR does not GC OGDC SR	554	1.54	0.2161
OGDC SR does not GC OGDC FR		38.31	0.0000

The test results of Grange Causality for PSO, PPL and OGDC is mentioned in above table. The probability value of null hypotheses FR do not cause SR for PSO, PPL and OGDC is greater than 5% so we reject null hypotheses and accept alternate hypotheses meaning that FR of PSO, PPL and OGDC does not cause SR of its own. Similarly, the probability value of null hypotheses SR does not cause FR is less than 5% so we reject null hypothesis meaning that SR of these companies does cause FR of its own.

Table 4.57: Granger Causality Test of Power Generation and Distribution, Technology and Communication, Cable & Electrical Goods, Synthetic & Rayon Sector

Null Hypothesis:	Obs	F-Statistic	Prob.
HUBC FR does not GC HUBC SR	922	2.33	0.0980
HUBC SR does not GC HUBC FR		71.39	0.0000
TRG FR does not GC TRG SR	922	5.32	0.0050
TRG SR does not GC TRG FR		61.91	0.0000
PAEL FR does not GC PAEL SR	758	1.61	0.2007
PAEL SR does not GC PAEL FR		55.79	0.0000
DSFL FR does not GC DSFL SR	1328	0.08	0.9249
DSFL SR does not GC DSFL FR		16.54	0.0000

In this table we can see that the probability value of null hypothesis of FR does not cause SR for HUBC, PAEL and DSFL is greater than 5% so we accept null hypothesis meaning that FR od these companies does not cause SR of its own. In Contrast, the probability value of null hypothesis SR do not cause FR is less than 5% so we reject null hypothesis meaning that we SR HUBC, PAEL and DSFL does cause FR of its own. For TRG we reject both null hypotheses of FR do not cause SR and SR do not cause FR meaning that both SR and FR of TRG cause each other. So here we saw two-way causality in TRG and one way causality from SR to FR in HUBC, PAEL and DSFL.

The results of this shows different results. For some companies it showed two-way causality and for some companies it showed one way causality. For companies in which FR leads SR means that those companies Future market contribution in price discovery is dominant. And for companies in which SR leads FR, in those companies' spot market contribution in price discovery is dominant. And for companies in which both SR and FR cause each other, for those companies we can say that these companies' future market and spot market both contributes to price discovery. The two-way causality result is aligned with (Bhatia et al. 2018; Dash et al. 2010) and one way causality result is aligned with (Jena et al. 2018; Joseph et al. 2014; Srinivasan, 2012).

CHAPTER 5
CONCLUSION AND POLICY RECOMMENDATION

5 Conclusion and Policy recommendation:

5.1 Conclusion

As we know that the future market trading was introduced to lower the risk in investing in Spot market. This risk management was important for investors and the other diversification opportunities for investment in portfolio encourage people to study future markets. The price discovery in spot due to future is studied by researchers across the globe.

The focus of this study is to find the causality between the future prices and spot prices of companies that are listed in PSX. To carry out this study, daily closing prices of both spot and future were taken. The return series is calculated by taking log of current period divided by previous period. Descriptive statistics Granger causality is run on return series and ADF and Cointegration test are run on log of original series.

Firstly, descriptive statistics were calculated of data to find the minimum, maximum, median, mean, standard deviation, skewness, and kurtosis of data. The descriptive statistics conclude that the behavior of data is different from company to company. But it can be seen that all companies future trading is riskier than its spot trading. Moreover, the return on both spot and future trading is different in all companies. In some companies the future returns are greater but in some the spot returns are greater.

As the data is time series, finding stationarity was important in the data. ADF test was used to find stationarity and the results conclude that data of all companies are stationary at 1^{st} difference not on level.

To find the relationship between variables, Johansen Cointegration test were used. But before that it was important to find the optimal lag length because it is compulsory for a test. Akaike Information Criterion AIC has been used to select the proper lag length and AIC conclude that for ENGRO, EEBL, BAFL, BOP and GDKC the best suited model is with data trend none with neither trend nor intercept having one lag. For EFERT, AKBL, HBL, FCCL, POWER, ATRL, CNERGY, GATM, NCL, NML, PSO, PPL, OGDC, HUBC and PAEL the best suited model is data trend none with intercept and no trend with only one lag. For FFC linear data trend with

intercept and no trend with two lags was selected to be best suited model. For DSFL linear data trend with intercept and trend with only one lag is best suited model. For FABL TRG and UBL the best suited model is quadratic data trend having intercept and trend with one lag for FABL and TRG and two lags of UBL.

Trace statistics and Max-Eigen Statistics, both results are important in Johansen cointegration, and both conclude that all companies have one cointegration equation exist in it except for FFC, UBL and HUBC in which two cointegration equation can be seen. This mean that the Spot and Future prices of the same companies move together.

After that variance decomposition test has been performed to find whether the variance in SR is due to its own SR or FR. The results conclude that in variance decomposition of SR, large effect is explained by its own SR series and only a small effect is explained by FR series. But in variance decomposition of FR, the result is different. The results conclude that the effect in FR series is up to 50% is explained by SR series and 50% is explained by its own FR series in most companies.

Impulse response graphs provide best graphical representation of shocks that we impose in our test. We can conclude from graph that the shocks in both spot and future does not las longer than five periods.

The granger causality test has been performed to find the causality between the SR FR series that whether there exists causality or not. If exists, then whether this causality is one way or two ways. The results conclude that there is two-way causality in FFBL, BOP, DGKC and TRG meaning that both SR and FR cause each other. There is one way causality from FR to SR in FFC, BAFL and FABL. Moreover, there is also one way causality from SR to FR in EFERT, ENGRO, AKBL, UBL, HBL, FCCL, POWER, ATRL, CNERGY, GATM, NCL, NML, PSO, PPL, OGDC, PAEL, DSFL, HUBC. To conclude the discussion, we can say that in Pakistan there is bidirectional causality for some companies SR and FR and for some companies SR and FR, there is unidirectional causality. And for some there is no causality between there SR and FR. Moreover, FFC, BAFL and FABL follow contango which is a behavior of Sock when future prices higher than spot prices meaning that when future return is followed by spot return. And EFERT, ENGRO, AKBL, UBL, HBL, FCCL, POWER, ATRL, CNERGY, GATM, NCL, NML, PSO, PPL, OGDC,

PAEL, DSFL, HUBC follows backwardation which is a behavior of stocks in which spot prices are higher than its future prices meaning that spot return is followed by future returns.

There is three forms of efficiency, weak form, semi strong form and strong form of efficiency. From the conclusion of this study, it can also be seen that Pakistani market is weak form efficient market as the returns of Spot and future is only reflected by their historic prices. Most of investors do not look for other public information related to stocks.

5.2 Policy Recommendation

The sources for transparency and price discovery in corporate governance is financial markets. The issues that investors face is the full availability of information. Mostly the information that is available for sellers and buyers in asymmetric in nature. But with time various products like swaps, future and forward contract was introduced to hedging and risk minimization (Levine, Ross. 2004). But is Pakistan, the stock market is not well developed specially the future market trading is exceedingly rare unknown to people.

To increase the volume of trading in future or even in both Spot and Future, the availability of data is important. The government should establish a way to easily transfer the information of PSX to both sellers and buyers. Other policy recommendation that can help the future trading to developed is mentioned below.

- Financial literacy can be major cause for being underdeveloped future trading. There is less confidence between investors that can be because of less marketing and campaigns and less available agents and there less use of online platform can also add up for being underdeveloped future trading.
- The less work of researchers in derivative market can be a cause of less use of Derivative market because there is less information available. So, more work must be done in this field.

CHAPTER 6

INTERVIEWS RESULTS

6 Interviews Result

To carry out interviews, questionnaire was developed to obtain the necessary information from firms that are involved in dealing with tock both spot and future. The questionnaire is given in Appendix B.

6.1 Summary of Answers:

The summary of answers is that there is no relationship between the Spot prices and Future prices of a companies. They both are quite different. The spot prices move irrespective from the future prices. The market data shows no relationship between them. No one can say that the investment in future or spot of a company having spot or future trading will be benefitted. Moreover, the future is considered to be riskier than spot as it directly hit the bank account irrespective of the willingness of investor. There is no causality between spot and future. The future prices are slightly high from spot, and it is because of the facility in future trading. This facility of ability of buying three time of more shares than money an investor has push prices slightly high. The future prices will not always be high, it can be sometimes low than spot. The information flow of future prices is very instant as spot prices, and it is publicly available of PSX. Promoting financial literacy in investors can decrease the risk that are involved otherwise there is no way to decrease the risk. The introduction of derivative market has only provided another product of investment. It cannot provide platform to reduce risk. We cannot build link between spot and future prices. Upon the theory that we study that derivative market can be used to reduced risk and provide risk management, they all concluded that the practical market does work the way theory suggest. Practical work is completely different from theories.

The possible explanation of practical situation not following theories is that people in Pakistan does not use tactics to avoid any negative returns. Their lack of knowledge leads them to make very random decision which make their investing behavior very random.

Details of interviewee are given in appendix C

References

Ali, G. (2013). EGARCH, GJR-GARCH, TGARCH, AVGARCH, NGARCH, IGARCH and APARCH Models for Pathogens at Marine Recreational Sites. *Journal of Statistical and Econometric Methods, vol. 2*(no.3), pp. 57-73. Retrieved from http://www.scienpress.com/Upload/JSEM/Vol%202_3_6.pdf

Ameur, H. B., Ftiti, Z., & Louhichi, W. (2021, June 16). Revisiting the relationship between spot and futures markets: evidence from commodity markets and NARDL framework. *Annals of Operations Research*. doi:https://doi.org/10.1007/s10479-021-04172-3

Arshanapalli, B., & Doukas, J. (1994). Common Volatility in S&P-500 Stock Index And S&P-500 Index Futures Prices During October 1987. *The Journal of Futures Markets, Vol. 14*(No. 8), pp. 915-925.

Awan, A., & Shah, S. M. (Spring 2014). The Price and Volume Effect ofSingle Stock Futures Trading on the Pakistani Stock Market. *The Lohore Journal of Business*, 1-32.

Bhat, R. B., & N., S. V. (2017). Lead Lag Relationship between Futures and Spot Prices in Select Nifty Companies. *International Journal of Financial Management, vol. 7*(2 & 3). Retrieved from http://www.publishingindia.com/ijfm/30/lead-lag-relationship-between-futures-and-spot-prices-in-select-nifty-companies/618/4380/

Bhatia, V., Das, D., Tiwari, A. K., Shahbaz, M., & Hasim, H. M. (2018). Do precious metal spot prices infuence each other? Evidence from a nonparametric causality-in-quantiles approach. Resources Policy, 55, 244–252

Black, F. (1972). Capital market equilibrium with restricted borrowing. The Journal of Business, 45(3), 444-455.

Black, F. (1986, July). Noise. *The Journal of Finance, Vol. XLI*(No. 3).

BOHL, M. T., DIESTELDORF, J., SALM, C. A., & WILFLING, B. (2016). Spot Market Volatility and Future Trading: The Pitfalls of Using a Dummy Variable Approach. *The Journal of Futures Markets, Vol. 36*(No. 1), pp. 30–45.

Darrat, A. F., Rahman, S., & Zhong, M. (2002, Fall). On The Role of Futures Trading in Spot Market Fluctuations: Perpetrator of Volatility or Victim of Regret? *The Journal of Financial Research, Vol. XXV*(No. 3), pp. 431–444.

Dash, M., & Andrews, S. B. (2010). A study on market behaviour and price discovery in Indian commodity markets. Available at SSRN 1722770.

Debasish, S. S. (2011, June 25). A study on granger causality between spot and futures prices for selected companies in India. *Elixir Finance Management*, pp. 3067-3073.

Derivative. (2020). Retrieved from PSX: https://www.psx.com.pk/psx/product-and-services/products/derivatives

Desk, N. (2007, May 11th). *Why does Pakistan need derivatives?* Retrieved from Business Recorder: https://fp.brecorder.com/2007/05/20070511562519/

Dickey, A. D. (2015). Stationarity Issues in Time Series Models. *Statistics and Data Analysis*, 1-17. Retrieved from https://d1wqtxts1xzle7.cloudfront.net/43177948/192-30.pdf?1456712291=&response-content-disposition=inline%3B+filename%3D192_30_Stationarity_Issues_in_Time_Serie.pdf&Expires=1613483159&Signature=NN8CdvzQXb5BSJMJvSqMNMP9PX6oEluWjhX4apKODAF7QgmvfYlgiA-TdzDA~

DRINKARD, T. (2019, June 25). *Stocks*. Retrieved from Investopedia: https://www.investopedia.com/articles/optioninvestor/06/singlestockfutures.asp#:~:text=Single%20stock%20futures%20(SSFs)%20are,on%20the%20specified%20future%20date.

Edwards, F. R. (1988, JANUARY-FEBRUARY). Does Futures Trading Increase Stock Market Volatility? *FINANCIAL ANALYSTS JOURNAL*, pp. 63-69.

Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance, 25*(2), 383-417. doi:10.2307/2325486

Fama, E. F. (1991). Efficient capital markets: II. The journal of finance,46(5),1575-1617

Garbade, K. D., & Silber, W. L. (1983, May). Price Movements and Price Discovery in Futures and Cash Markets. *The Review of Economics and Statistics, Vol. 65*(No. 2), pp. 289-297. Retrieved from https://www.jstor.org/stable/1924495

Granger, C. W. (1969, Aug.). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica, Vol. 37*(No. 3), pp. 424-438. Retrieved from https://www.jstor.org/stable/1912791

Gupta, K., & Singh, B. (2006, January). Price Discovery and Causality in Spot and Future Markets in india. pp. 30-41.

Haque, N. U. (1997). Financial market Reform in Pakistan. *The Pakistan Development Review*, 839-854.

Hern´andez, M. A., Ibarra-Ram´ırez, R., & Trupkin, D. R. (2011, December). How Far Do Shocks Move Across Borders? Examining Volatility Transmission in Major Agricultural Futures Markets. Retrieved from http://hdl.handle.net/10419/83689

Hernandez, M., & Torero, M. (2010, June). Examining the Dynamic Relationship between Spot and Future Prices of Agricultural Commodities. *IFPRI Discussion Paper 00988*.

Hjalmarsson, E., & Österholm, P. (2007, June). Testing for Cointegration Using the Johansen Methodology when Variables are NearIntegrated . *IMF, WP/07/141*.

Hull, J. C. (1989). *Options, Futures and Other Derivatives* (Nine ed.). (D. Battista, Ed.) Pearson.

Hull, J.C. (2008), Fundamentals of Futures and Options Markets, 6th ed., Pearson/Prentice-Hall,Upper Saddle River, NJ

Jamal, N., & Fraz, A. (2013). Relationship of Single Stock Futures with the Spot Price: Evidence from Karachi Stock Exchange. *Journal of The Institute of Business Administration (IBA), Vol. 8*(No. 1), pp. 52-76.

Jameel, K. (2008, February). Financial Environment for Derivatives: Growth and New Dimensions for Financial Derivative Market in Pakistan; A Case Study.

Jena, S. K., Tiwari, A. K., & Roubaud, D. (2018). Comovements of gold futures markets and the spot market: A wavelet analysis. Finance Research Letters, 24, 19–24.

Joseph, A., Sisodia, G., & Tiwari, A. K. (2014, April 15). A frequency domain causality investigation between futures and spot prices of Indian commodity markets. *Journal of*

Economic Modeling, Vol. 40, pp. 250-258. doi:http://dx.doi.org/10.1016/j.econmod.2014.04.019

Juneja, P. (2015). *Derivative*. Retrieved from MSG Managment Study Guide: https://www.managementstudyguide.com/types-of-derivatives.htm

Kaur, K. (2019, March). Causality Relationship Between Spot and Futures Markets: Evidence from India. *IUP Journal of Financial Risk Management, 16*(1), 50-58. Retrieved from https://www.proquest.com/openview/24f8e9fc08852a5fc0323499c60c2289/1?pq-origsite=gscholar&cbl=54459

Khan, S. U., & Hijazi, S. T. (2009). Single Stock Future Trading and Stock Price Volatility: Empirical Analysis. *The Pakistan Development Review, Vol. 48*, 553-563.

Koop, G., Pesaran, M., & Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. *Journal of Econometrics, Volume 74*(Issue 1), pp 119-147. doi:https://doi.org/10.1016/0304-4076(95)01753-4.

Lee, C. L., Stevenson, S., & Lee, M. L. (2014). Futures Trading, Spot Price Volatility and Market Efficiency: Evidence from European Real Estate Securities Futures. *J Real Estate Finan Econ, 48*, pp. 299–322. doi:DOI 10.1007/s11146-012-9399-3

Levine, Ross. (2004). Finance and Growth: Theory and Evidence. National Bureau of Economic Research, Inc, NBER Working Papers. 10766.

Liew, Venus. (2004). Which Lag Selection Criteria Should We Employ?. Economics Bulletin. 3. 1-9

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. The review of economics and statistics, 13-37.

Louangrath, Paul. (2013). Re: When and why should I do variance decomposition?. Retrieved from: https://www.researchgate.net/post/When-and-why-should-I-do-variance-decomposition/52a12bf1d3df3e01058b45dc/citation/download.

Malik, I. R., Shah, A., & Khan, S. (2013, January–December). Single Stock Futures Trading and its Impact on Feedback Trading and Volatility: A Case Study of Pakistan. *Forman Journal of Economic Studies, Vol. 9*, pp. 81-107.

Malkiel, B. G. (2003, Winter). The Efffecient Market Hypothesis and Its Critics. *Journal of Economics Perspectives, Vol. 17*(No. 1), pp 59-82. Retrieved from http://www.bu.edu/econ/files/2011/01/Malkiel.pdf

Martikainen, T., & Puttonen, V. (1994). International Price Discovery in Finnish Stock Index Futures and Cash Markets. *Journal of Banking & Finance, Vol. 18*, pp. 809-822.

MAVERICK, J. B. (2020, April 03). *Options & Derivatives Trading*. Retrieved from Investopidia: https://www.investopedia.com/ask/answers/070815/what-are-main-risks-associated-trading-derivatives.asp#:~:text=Among%20the%20most%20common%20derivatives,liquidity%20risk%2C%20and%20interconnection%20risk.

MIN, J. H., & Najand, M. (1999). A Further Investigaion of The Lad Lag Relationship Between The Spot Market and The Stcok Index Future: Early Evidence From Korea. *The Journal of Futures Markets, Vol. 19*(No. 2), pp. 217–232.

Min, J. H., & Najand, M. (1999). A Further Investigation of the Lead Lag Relationship Between the Spot Market and Stock Index Futures: Early Evidence From Korea. *The Journal of Future Markets, Vol. 19*(No. 2), 217-232.

Mishkin, F. S. (2005). *The Economics of Money, Banking and Financial Markets* (Tenth ed.). Person.

Obadi, S. M., & Korcek, M. (2018). The Crude Oil Price and Speculations: Investigation Using Granger Cauality Test. *International Journal of Energy Economics and Policy, vol. 8*(No. 3), pp. 275-282. Retrieved from https://www.researchgate.net/profile/Saleh_Obadi/publication/325291525_The_Crude_Oil_Price_and_Speculations_Investigation_Using_Granger_Causality_Test/links/5b06b558a6fdcc8c252363a7/The-Crude-Oil-Price-and-Speculations-Investigation-Using-Granger-Causalit

Ozdemir, L., Ozen, E., Grima, S., & Thalassinos, Y. (2019). Causality Between Spot and Future Markets of the Borsa Instanbul Index and the Dow Jones Industrial Average. *International Journal of Finance, Insurance and Risk Management, IX*(3-4), pp. 115-131.

ÖZDEMİR, L. (2021). Causality Relationship between Spot and Futures Bitcoin Prices in CME. *Journal of Corporate Governance, Insurance, and Risk Management (JCGIRM), Vol. 8*(Series 2), pp 158-169. doi:https://doi.org/10.51410/jcgirm.8.2.11

Pathak, R. (2009). Testing for Granger Causality in Futures Volume and Stock Returns Relation. *ICFAI Business School*.

Percili, A., & Koutmos, G. (1997). Index Futures and Options and Stock Market Volatility. *The Journal of Futures Markets, Vol. 17*(No. 8), pp. 957–974.

Rafay, A., Gilani, U. J., Naeem, M. A., & Ijaz, M. (2015). Volatility Modeling for Spot and Futures of Crude Oil –Evidence from Pakistan. *Abasyn Journal of Social Sciences, Vol. 8*(No. 2), pp. 298-309.

Rahman, M. H., & Das, B. C. (2015, December). Necessity of the Establishment of a Financial Derivative Market in Bangladesh. *International Journal of Management Science and Business Administration, Volume 2*(Issue 1), Pages 20 - 31.

Rastogi, S., & Athaley, C. (2019, June 9). Volatility Integration in Spot, Futures and Options Markets: A Regulatory Perspective. *Jornal of Risk and Financial Management*. doi:https://doi.org/10.3390/jrfm12020098

Sarwat, S., Kashif, M., Aqil, M., & Ahmed, F. (2019, May 22). Determination of Causality in the Prices of Crude Oil. *International Journal of Energy Economics and Policy, Vol. 9*(No. 4). doi:https://doi.org/10.32479/ijeep.7724

Sayani, H. (2017, June). Derivatives in Pakistan: Challenges, Opportunities and Recommendations.

Schnabel, J. A. (2010). Interest rates, commodity prices,and the cost-of-carry model. *The Journal of Risk Finance, Vol. 11*(No. 2), pp. 221-223. doi:10.1108/15265941011025215

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. The journal of finance, 19(3), 425-442.

Srinivasan, P. (2010). Price Discovery in NSE Spot and Futures Markets of India: Evidence from selected IT Industries. *Bhavan's International Journal of Business, Vol. 4*(No. 1), pp. 16-27.

Srinivasan, P. (2012, May 17). Price Discovery and Volatility Spillovers in Indian Spot-Futures Commodity Market. *The IUP Journal of Behavioral Finance, Vol. IX*(No. 1), pp. 70-85. Retrieved from https://mpra.ub.uni-muenchen.de/47412/

Strong, R. A. (2005). Derivatives: An introduction (2nd ed.). Mason, OH: Thomson, South-Western.

Talbi, M., Peretti, C. d., & Belkacem, L. (2020). Dynamics and causality in distribution between spot and future precious metals: A copula approach. *Elsevier*. Retrieved from https://www.sciencedirect.com/science/article/pii/S0301420719305215

Tokat, E., & Tokat, H. A. (2010, July-August). Shock and Volatility Transmission in the Future and Spot Market: Evidence from Turkish Markets. *Emerging Markets Finance & Trade, Vol. 46*(No. 4), pp 92-104.

Truong, D. L. (2006). Equitisation and stock-market development: the case of Vietnam. University of Groningen.

Turkington, J., & Walsh, D. (1999, December). Price Discovery and Causality in the Australian Share Price Index Futures Market. *Australian Journal of Management, Vol. 24*(No. 2), pp. 97-113.

Zakoian, J. M. (1994, December). Threshold Heteroskedastic Models. *Journal of Economic Dynamics and Control*, pp. 931-955.

Zhou, X. (2016, May 04). The Lead-Lag Relationship Between CSI 300 INDEX AND CSI 300 INDEX Futures in China.

Zhou, Z., Dong, H., & Wang, S. (2014). Intraday Volatility Spillover between Index Futures and Spot Market: Evidence from China. *Procedia Computer Science*, 721-730.

Appendix A

Table 3.1: Companies Details			
S. No	**Company name**	**Symbol**	**Sector**
1	Bank Alfalah Limited	BAFL	Commercial Banks
2	Bank of Punjab	BOP	Commercial Banks
3	Faysal Bank Ltd.	FABL	Commercial Banks
4	Askari bank limited	AKBL	Commercial Banks
5	United Bank Ltd.	UBL	Commercial Banks
6	Habib Bank Limited	HBL	Commercial Banks
7	Engro Fertilizers Ltd.	EFERT	Fertilizers
8	Engro Corporation Ltd.	ENGRO	Fertilizers
9	Fauji Fertilizer Bin Qasim Ltd	FFBL	Fertilizers
10	Fauji Fertilizer Company Ltd.	FFC	Fertilizers
11	D.G. Khan Cement Co. Ltd.	DGKC	Cement
12	Fauji Cement Co. Ltd.	FCCL	Cement
13	Power Cement Ltd	POWER	Cement
14	Attock Refinery Ltd	ATRL	Refinery
15	Cnergyico PK Ltd(cynergy)	CNERGY	Refinery
16	Gul Ahmed Textile Mills Ltd.	GATM	Textile Composite
17	Nishat (Chunian) Ltd.	NCL	Textile Composite
18	Nishat Mills Ltd.	NML	Textile Composite
19	Pakistan State Oil Co. Ltd.	PSO	Oil and Gas Marketing Companies
20	Pakistan Petroleum Ltd.	PPL	Oil and Gas Exploration companies
21	Oil & Gas Development Co. Ltd.	OGDC	Oil and Gas Exploration companies
22	Hub Power Company Ltd.	HUBC	Power Generation and Distribution
23	TRG Pakistan Ltd	TRG	Technology and Communication
24	Pak Elektron Ltd	PAEL	Cable & Electrical Goods
25	Dewan Salman Fibre Limited	DSFL	Synthetic & Rayon

Appendix B

Questionnaire

- What is derivative stock market?
- What is future trading?
- Does spot and future market have any relationships?
- Does Spot prices causes to rises future prices and vice versa?
- Does market data show the relationship of spot and future trading?
- what are the causes of having or not having the relationship between spot and future?
- Does investment in Spot of a company having future trading of that company as safe?
- How much introduction of future trading have helped in minimizing risk?
- What need to be done in decreasing the risk that are involved spot trading as well as future trading?
- What is the time duration of information in variation in prices in both spot and future to general public?
- As we study is theories "derivative market can be used to minimize risks." Does practical it is possible to minimize risk through derivative market (Future trading)?

Appendix C

Details of interviewee:

Name: Azhar
Company name: Askari Securities Ltd
Designation: Head of Equities
Company office No: 051-2894521

Name: M Ammar
Company name: Fair Edge Securities Pvt Ltd
Designation: Equity Traders
Company office No: 051-2894536

Name: Asad Abbas Nafji
Company name: Arif Habib Limited
Designation: Assistant Manager
Company office No: 051-2894505

Name: Ijaz
Company name: Millennium Brokerage Pvt Ltd
Designation:
Company office No: 051-2802275

Name: Abdul Hassan
Company name: Zahid Latif Khan Securities
Designation: Equity Manager
Company office No: 051-2894401