Volatility Transmission from oil prices to Agriculture commodity and Stock Market in Pakistan

by

Attia Ayub

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To Almighty Allah who has created us as crown of creation and enable us to learn. This thesis is dedicated from core of my heart to my beloved parents Mr. Muhammad Ayub & Ms.Zahida Parveen, my Uncle Ghafoor Hussain, my sisters and friends specially Saqaf Iftikhar who always appreciate me in every step and to my teachers who help me at all stages of study. This journey would not have been possible without your loving support and encouragement

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MMS 161015

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Supervisor Name
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———————————————
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Dept. of Management Sciences
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Abstract

The purpose of this study is to investigate the integration of oil market returns (Crude Oil) with 6 agriculture commodities, exchange rate (RS/US$) and equity returns of Pakistani equity market. The study has employed the standard methodology of GARCH-M for mean and volatility spillover as used by Bhar and Nikolova (2007). The data of information transmission from Crude oil to agriculture commodity and exchange rate is taken on monthly frequency for the period of 1997 to 2017. For mean and volatility spillover from Crude oil to equity returns is collected on daily frequency for the same period. The findings of the study indicate that the volatility is transmitted to the returns of exchange rate and different commodities include, wheat, palm oil, and cotton. Furthermore, the volatility spillover is also observed from crude oil to exchange rate, equity market, sugar and palm oil. The results of the study suggest that the fluctuations in world crude oil market are transmitted to returns and volatility of the agricultural commodity market, exchange rate and stock market in Pakistan.

Key words: Crude Oil, Agriculture Commodities, Exchange rate, Stock market, Volatility spillover, mean spillover.

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Abbreviations

CR	Crude Oil
Wh	Wheat Market
Ri	Rice Market
Cot	Cotton Market
Cor	Corn Market
Po	Palm Market
Ex	Exchange Market
KSE(100)	Pakistan Stock Exchange

Chapter 1

Introduction

1.1 Background of the Study

Crude oil prices are always debated for oil importing countries.The fluctuation in oil prices is always a matter of concern for economies like Pakistan, whose one third of the imports are related to oil products. In Pakistan, three major sectors industry, transportation and electricity are dependent on oil inputs. Due to the huge gap between oil production and consumption in Pakistan, the fluctuations in oil prices directly affect the production cost, consumption level, balance of payment, capital markets and country as a whole. Number of studies have investigated the integration of crude oil, agriculture commodities and stock market(Nazlioglu, Erdem & Soytas, 2013; Kilian & Park, 2009). The volatility transmission from oil market to commodity market is less attended in general.

In last couple of decades, large fluctuations in commodity prices have been observed. The increasing prices of crude oil play a leading role in the increase in the commodity market until the global financial crisis (Cevik and Sedik, 2011). The crude oil prices have risen so quickly until the 2008 and then follow a sharp decline during the financial crisis, the same fluctuations are observed in recent

past. These fluctuations in oil prices have increased the inputs to the industrial production and agricultural commodities locally. An increase in oil prices lead to high prices of products (agriculture crops) due to increase in input prices (fuel), high transportation cost, increase budget deficit, and put downward pressure on exchange rate which makes imports costlier. The oil shocks have significant impact on oil importing developing countries, due to the greater dependency on oil imports and the inefficiencies prevails in the oil market (Ali, Huang & Yang, 2013).

The stock market also plays a significant role in the economic development and the development of financial sector with in the country. It provides a platform for local and foreign investor to invest in stocks and bonds. It shows the confidence of the investor on the economy which is a positive sign for the economy of a country. The income and cash flow streams are directly affected by fluctuation in world oil prices. An increase in oil prices mean inputs will be costly and a decrease in oil price show cheaper input cost and increment in earnings. Keeping the views of the fluctuation of oil prices, it is necessary to check the dynamics of oil markets and its integration with the commodity market, exchange rate and equity prices. The aim of this study is to investigate the volatility transmission from oil market to the selected agriculture commodities, Pakistan stock exchange, and exchange rate of Pakistan from US dollars.

Since, most of population of Pakistan economy based on chemical, textile, food and agriculture based trading. Volatility in oil price effected the individual, organization and as well as whole economy lifespan. Consequently, millions of poor farmers, people who cannot have fund for machinery, fuels and other commercial farm inputs, whose survival are based only on farming face it as weakness in the global food economy and this lead chronically to the hunger.

1.2   Theoretical Background

Fundamentally, signaling theory states the behavior of two parties (individuals or organizations) when they have access on different information. As shown by this theory one party, the sender, must select whether and how to interlink (or signal) with that information. While on other hand the receiver also must select how to enact on the signal. Signal theory is useful for all studies departments especially in management literature. Individuals in households, businesses, and government require market information to make decisions for investment, portfolio risk management and capital asset pricing. Information effect on their decision making process. Decision made by individual is based on public information that is openly accessible in the market. Stiglitz (2002) study says that when different people know different things information asymmetry emerges. The study also shows that information asymmetries occurs among the people one who hold the private information and one who does not share information to other for more better decision and to earn more profit. The study of Stiglitz (2000) has shown its importance and deliberate two kinds of information. (1) Information about quality which states that information asymmetry is important when characteristics of one party are not fully available to another party. (2) Information about intent states that one party depends on behavior of other party also known as behavioral intentions (Elitzur & Gavious, 2003). The study of Spence (1973) which states about labor market signal to their education and concluded that, to reduce information asymmetries, potential employers must obtain the education so they have information about quality of job candidates.

To clarify these broad relations different illustrations has created by monetary financial analyst. They propose in their studies that firm debt Ross (1973) and dividends Bhattacharya (1979) give signals of firm performance and its quality.

The study has examined that high quality firm has more ability to pay dividend to its shareholders for long term. On other hand low quality firms cannot sustain dividend payment for long term. External participants like lenders and investors has also effected from these signals. In addition, signaling theory comprises on two fundamental components (1) signaler and (2) receiver (3) signal itself. Signaler: According to signaling theory signaler is who inside the organization like executives or mangers and obtains information about other individual, product or organization that is not available to outside. Information can be positive or negative about organizations product or service (Spence, 1973; Kirmani & Rao, 2000; Ross, 1977). Signal: insiders of organization get both positive and negative information and they have to decide whether this information may share to outsiders or not. A few researchers contented that these are action taken by insiders to communicate positive or negative information about organization attributes like issuing new shares is considered as negative signal. Receiver: the third element of signaling theory is receiver, outsider who has lack of information about organization and wants to know the information about organization, such as receiver may need information about purchasing, hiring or investing.

For the reason that Pakistan is considered as oil importing country and import colossal sum of unrefined oil each year. By way of Pakistan population growing it is seemed that oil and its relative items has highly requested from consumers, industry and agribusiness divisions. A theory of signaling is strongly support this study and illustrate that change in oil prices influence the stock market, exchange rate and other commodities at that moment deliver signs to expect any unforeseen rise in inflation.

Another theory of efficient market hypothesis underpins this study as well. Efficient-market hypothesis (EMH) guarantees that assets are priced precisely and reflect

all available information to the participants of the market at any point of time in same way. When market participants and players anticipate that the oil prices will increases gradually over the next few months, they will adjust their costs appropriately so that there will not be an enormous effect on the firm's market value. On the other hand, if there exists a high degree of uncertainty in world oil market, it is quite difficult to adjust their costs effectively.

Change in oil price affects overall macro economy of a country through various channels. Oil-importing countries like (Pakistan) normally encounters drop in their balance of payments, putting downward pressure on exchange rates, subsequently imports ended up more costly and exports less profitable, leading to a fall trend in real national income. As per oil is utilized as an input in the production process, to produce power and for transportation purpose. At long last this information require to individuals, firms and policy makers for effective decision making process.

1.3   Research Gap

This study is an effort to fill the gap in both literature and practical field regarding mean and volatility transmissions between world oil prices, agricultural commodity market, exchange rate and stock market of Pakistan because previously have not research that have been conducted in the context of Pakistan by using these variables and model specification.

1.4   Problem Identification

Pakistan is considered as oil importing country and it imports huge amount of crude oil each year from international oil exporting countries. Pakistans trading generally based on agricultural and industrial sector. As Pakistan population growing appeared that oil and its related products has highly demanded in industrial and for agrarian segment and oil consumption has expended as well. An economy of a country has openly effected by any increment in international oil prices. It also depreciates domestic currency and caused of inflation in the country. So instability in oil price influenced the individual, organization and as well as whole economy lifespan. Agrarian commodities are the crucial and the essential prerequisite for the human creatures, any fluctuation in these items cost, has straightforwardly influenced the buyer budget, it reduces the purchasing power of the people and they are incapable to avail their numerous basic needs. Pakistan stock market has too effected positively or contrarily due to volatility of oil prices. High oil prices appear high input costs and it influence specifically firms profit whereas, low oil price show low input cost and more profit. In addition decay in shares worth may cause of reduction in firms profits. High input cost of organization due to inflation may lead firms to stress in decision making process like obtaining, contracting or contributing. These reasons have contrarily affected on individuals living standard especially those who have fixed income. Fluctuation in oil prices lead to create inflation in the country, market investors who invest in stock exchange also observe inflation rate of the country because this inflation rate has effect on their investment and returns. Investors may need information to evaluate the risk factor in the society and also profit margin. The increase in inflation rate cause to increase in interest rate that makes difficulties for investors to survive in the market. Jebabli, Arouri and Teulon (2014) has been concluded that

expected inflation can either positively or negatively impact the stocks, depending on the ability to hedge and the governments monetary policy.

This is a problem, marvels that ended up saver in developing countries and need to pay consideration these sorts of problems and make increment in the productivity of the country so, this study will discuss in the perspective of Pakistan. The study of Jhingan (2002) has stated that exchange rate of economy is a critical component because international competitiveness can effectively maintain through stable exchange rate. Mordi (2006) has also showed the importance of this variable (exchange rate) and assert that domestic price of a country can be in shaped through sustaining of a countrys exchange rate. Generally, various countries calculate their profits in term of US Dollars by domestically produce goods and service and trade to other international countries. US Dollars are acceptable world widely in international transactions. Decision of fixed or floating exchange rate is taken by Central bank of a country. In developing countries like (Pakistan) volatility in exchange rate lead to a saver problem.it can create problems consisting (price instability and decline in economic growth) for investors and policy makers.

Obadan (2006) has discussed that variations and insecurities known as Volatility in term of asset pricing, portfolio optimization and risk management. Pakistan is an agrarian based country and steadily moving to mechanization. It produces agriculture based crops like rice, wheat corn, vegetables and fruits and trade to other country. Because, Pakistan import the oil so any change in oil prices can directly effect on its exchange rate from US dollar. High oil prices lead to expensive imports, balance of payment show budget deficit and vice versa. Messe and Rose (1983) show the relation among interest rate and exchange rate. As exchange rate go higher, foreign investor get more attracted, this attractiveness convert the balance of payment in surplus so domestic currency have more valued. Further, due

to inflation exchange rate decline in the country, because inflation force investor to move and invest their profits out of the country. Domestic currency devalued when foreign currency demand increased.

1.5   Problem Statement

The ups and downs in oil prices have an effect on the inputs of commodities and the commodity price respond to the change in oil prices. In last two decades oil prices shocks have been observed (Skintzi & Refenes, 2006; Arouri, jouini & Nguyen, 2011; Aloui, 2007; Elmarzougui & Larue. 2013). This study has focused on the oil prices changes and the transmission of there shocks into commodity and stock prices in Pakistan.

1.6   Research Questions

This research will answer the following questions:

Research Question 1

Whether volatility of oil prices transmit to food prices in Pakistan?

Research Question 2

Does a mean spillover of oil prices transmit to the return of food prices in Pakistan?

Research Question 3

How oil prices influences the Pakistan equity market?

Research Question 4

Whether the volatility spillovers of oil prices transmit to the Pakistan equity market?

Research Question 5

How mean spillover of oil prices transmit to the exchange rate?

Research Question 6

Whether the volatility spillover of oil prices transmits to the exchange rate?

1.7 Research Objectives for This Study

Objectives of the study are as follows:

Research objective 1

To explore the mean and volatility spillover of oil prices to food prices, equity market and exchange rate in Pakistan.

Research objective 2

To provide insight about the oil prices behavior towards commodity market, stock market and bilateral exchange rate in Pakistan.

1.8 Significance of the Study

Numerous studies have been conducted to check the relation among instability of oil prices, agriculture commodities, stock market and exchange rate but there are few studies conducted in the context of Pakistan. As discussed that Pakistan is an emerging country and in general its trading comprises on chemical, textile, food and agrarian segments. Oil price volatility effect individual, organization and as well as whole economy. This study will be helpful for investors, economic policy makers and academia both in theoretical and practical field.

Though Pakistan is an evolving state and it needs colossal sum of oil to perform its daily activities. as of now, Pakistan has been enduring from shortage of energy sources that make difficulties because it intensively depended on the imported oil to fulfill its needs. An economy of a country take directly effect from high international oil prices. It depreciates domestic currency and lead to inflation in the country. Exchange rate is the price of Pakistani currency (Rupee) against the other country. In this study price of Pakistani Rupee in term of US dollar meaning how many Pakistani rupees are required to buy one US dollar. Due to increase in oil prices, Pakistan exchange rate depreciated that leads to inflation in the country. Which hence diminish the purchasing power of the people and they are unable to avail their various basic necessities.

Fluctuation in oil prices has a great effect on whole economy of any country. High oil prices are by and large lead to inflation and diminish economic growth of the country. When there is inflation in nation state, prices of goods made with petroleum products have directly effect from the oil prices. Oil prices also indirectly affect the cost of production, manufacturing and transportation as input. On the other hand decreases in oil prices cause to increase the economic growth of the country. Falling international oil prices is blessing for a country like Pakistan.

Movement in oil prices lead to inflation in the country, investors who contribute in stock exchange watch inflation rate because it affect their investments and returns. Investors may know information to evaluate the risk factor in the society and also profit margin. The increase in inflation rate cause to increase in interest rate that makes troubles for investors to outlive in the market. In all over the world and mainly in Pakistan, crude oil demand has been increases day by day. The influence of oil prices shocks on exchange rate become more prominent problem. To maintain effective exchange rate government should make proper strategies to balance the

supply and demand. Moreover this study will shed light further relation among oil price volatility and movement in exchange rate of the country. Investors may be able to know about the informational efficiency and can make effective decisions in investment through this they could make effective plans like reduce their fuel costs, condense the cost of capital (interest) and earn more profit. Volatility in oil prices for example if oil prices move upward companies reduce consumption of fuel as input. For academia purpose this study will helpful for researchers and have insight on relation between oil prices, stock market, agricultural commodities and exchange rate.

Chapter 2

Literature Review

Oil is an essential measure and an important factor for economic growth of developing countries. Generally prior literature in view of oil shocks effect proven vulnerable for developing countries other than developed countries. The degree of integration of oil market returns (Crude Oil) with agriculture commodities, exchange rate and equity returns has long been studied. There are number of studies have investigated that oil shocks shifted from one marketplace to another. This section of the study insight on the existing literature and collect some evidence about volatility spillover among oil shocks, agriculture commodities, equity market and exchange rate from US dollar in view of Pakistan. It also shows that because of some latest Changes and empirical analysis, agriculture and stock market take more consideration by investors, policy makers and other interest groups.

A very first contribution as a matter of fact has investigated by Hubbard and Weiner (1986) for oil importing countries. The study initially shows the importance of oil shocks in view of oil supply disruption for international cooperation. Further the study has discussed that information transmission depended somehow, when oil markets globally interspersed. The findings of the study have been observed that oil shocks play a leading role in economic destruction in view of less

productivity and high inflation rate. Each country should increase its national income and have to decrease the cost of supply operations.

Papapetrou (2001) proposes that oil shocks have an effect on Greece states economy. In view of this fact, the study has employed different variables i.e. oil prices, stock returns, exchange rate, economic activity and employment rate. For data analysis the study has used multivariate vector-auto regression VAR model. However, the results of the study observed that economic activity and employment rate of state significantly affected by oil shocks. Further the study has also argued that oil prices are central to measure the stock prices movement. Volatility in stock market has no effect on Greece economy and employment rate. In addition, the study of Rafiq, Salim and Bloch (2009) has also investigates the relation among oil shocks and macroeconomics factors for Thailand. This study has employed vector auto-regression (VAR) system and concluded that macroeconomic indicators, such as unemployment and stock market do have a significant impact from world oil shocks because oil prices volatility transmitted to states economy in view of budget deficit.

The effect of oil shocks on agriculture market is an essential part for any economy to measure its economic and production ability. The study of Malik (2008) has analyzed that oil prices and output (GDP growth) are found to be strongly interlinked in view of Pakistan . However this relationship is non-linear. The study has also demonstrate that there exist a risk transfer mechanism between world oil prices and output because high oil prices start hurting the economy in term of low investments, low production and budget deficit. Further suggests that government need to sustain this rising trend. Elyasiani, Mansur and Odusami (2011) also observe the relation among oil shocks and oil returns covering thirteen US industries by employing GARCH (1, 1) technique. The results of the study have

shown the significant relationship among oil future returns and industrys surplus returns. In addition proved that oil future returns influence more than volatility. On the other hand Wang and McPhail (2014) study has used VAR model and argued that interim production growth receipts negative impact from the energy prices. Further Risheq (2016) has examined the impact of oil shocks on industrial production with other key variables. The study has used sample data for the period of 1970 to 2012 in view of 52 developing countries. For the purpose of data analysis the study has used fixed effect model with instrumental variables and found out that industrial production grasps a negative and highly significant impact from high oil prices.

The study of Saghaian (2010) has testified that there is a strong correlation among oil and commodity prices, however results have provided mixed evidence for oil to commodity prices. Khan and Ahmed (2011) has examined the impact of global food and oil shocks by using Structural vector autoregressive model (SVAR) and indicates that oil and food have significantly related to each other. The study employs different variables (output, interest rate, inflation rate and exchange rate) and also suggests that supply and demand side disturbance due to oil shock are the major causes of inflation in Pakistan.

Nazlioglu and Soytas (2012) have employed monthly data for the period of 1980 to 2010, panel of twenty four agricultural products. For data analysis the study has used a cointigration and Granger causality approach. The result of this study suggests that agricultural commodities do have volatility transmission from oil market. Awartani and Maghyereh (2013) have proposed a new spillover directional measure for Gulf cooperation Council Countries. The study examined volatility spillover relation between oil and Stock markets. For the purpose of data analysis, the study has employed time period of 2004 to 2012. The findings of the study

suggest that return and volatility transmission are bi-directional. The study has also observed that in GCC countries, oil market perform a main role for the transformation of information of oil equities. The study of Ismail and Jabeen(2014) have shown return and volatility spillovers relation among the major food and agricultural commodity prices by using GARCH models. The result of the study indicates that change in price of one commodity influenced the price of its other substitute commodity. Similarly, Nazlioglu et al. (2013) have examined the relationship among oil and agricultural commodity to test the volatility movement. For this purpose the study applied Causality in variance test and impulse response functions. The results of the study suggest that under the food crises, dynamics of volatility transmission changes significantly.

Volatility transmission among crude oil and agricultural market in view of china is observed by Haixia and Shiping (2013). The study has employed different variables (crude oil, corn and fuel ethanol market) by using Univariate EGARCH and BEKK-MVGARCH model. The study indicates that these variables i.e. crude oil, corn and fuel ethanol receipts significant ARCH effect and also suggests to giving more attention on the factors that makes cause of high oil prices. The study of Jebabli et al. (2014) has used VAR (TVP-VAR) model and concluded that volatility spillovers significantly proliferate during the period of crises. The study has also detected that assorted portfolio for food commodities with crude oil and stocks have significantly improve its risk- adjusted performance. Moreover Liu (2014) has examined cross-correlations among crude oil and agricultural commodity markets. For the analysis the study has used DCCA model and find out that agricultural commodity markets do have volatility cross-correlations from oil market. Moreover, the study has verified the existence of a linkage between agriculture commodities and oil prices.

In contrast there is a literature exist designates that there is no direct relationship between oil and agriculture commodity prices like the study of Zhang et al.(2010) argued that oil and agricultural commodity prices has no direct long-run price relations, and direct short- run relation if any is determinate. similarly Esmaeili and Shokoohi (2011) have also argued that oil prices have indirect impact on food prices. Natanelov at al.(2011) have examined volatility among crude oil, agriculture commodities and gold futures by using causality and cointigration tests. conversely the study of Nazlioglu (2011) has used linear causality analysis, and claimed that oil prices and the agriculture commodity price do not influence each other.

As regard to volatility transmission between oil prices and stock market Zhang and Chen (2011) have investigates the impact of world oil shocks for China stock market by using ARJI (-ht)-EGARCH model. The study has concluded that World oil prices have a positive effect on China stock market and further argued that this relation is immaterial. The study of Sadorsky (2012) has also examined the impact of volatility spillovers among oil prices and the stock prices of clean energy and technology companies by using four different multivariate GARCH techniques i.e. BEKK, diagonal, constant conditional correlation and dynamic conditional correlation. The findings of the study has reported that dynamic conditional correlation model generate the best outcomes and spring evidence in order that stock prices of clean energy companies have extremely unpredictable impact for technology stock prices other than with oil prices. A study of Mensi et al. (2013) have examined the relation among US stock market (S&P 500 index) and commodity markets by using VAR-GARCH model. The stud has concluded that these variables have significant volatility transmission among them similarly, the study of Creti, Jots, and Mignon (2013) have used dynamic conditional (DCC) GARCH methodology

and proved that during the period of 2007-2008 financial crises, correlations between commodity and stock markets are highly volatile. Volatility transmission between oil prices and Russia stock market has observed by Bhar and Nikolova (2010). For the purpose of analysis the study used dynamic bivariate exponential general autogressive conditional hetroskedastic (EGARCH) test and suggest that Russian stock market ensured a significant volatility effect from oil market. The study also promoted the worldwide position of Russias site as a reliable supplier of oil in Middle East during the period of turmoil. However, Russia oil industry faces many challenges that make it to compromise on future economic development and performance of Russias stock markets.

The study of Reboredo (2014) has examined relation between oil shocks and US market. The study employs univarate and bivariate GARCH model. To analyze this relation the study has used structural breaks model and employed daily data for the period of July 1996 to June 2013. The study has stated that when structural beaks were ignored in the model, volatility spillover does not exist among oil shocks and US market. On the other hand by using structural break model the study has found that there is strong volatility spillover effect among both variables as well. Khalfaoui, Boutahar and Boubaker (2015) have observed mean and volatility spillover effect among two factors (oil shocks and G7 stock market) for different time prospects. For this purpose the study has used multivariate GARCH and wavelet models by using daily data of oil and stock indices prices. The findings of the study provide strong evidence of volatility for all markets in the context of time. To make more strong evidence, this study has also calculates optimal portfolio hedge ratios. Adjasi, Harvey and Agyapong (2008) have examined the impact on Ghana stock market from the exchange rate variations plus other macroeconomics variables i.e. Treasury bill rates, money supply and interest rate. To examine

this relation the study has used the time period of 1991 to 2005 and provides evidence that there is inverse relationship between returns of Ghana stock market and exchange rate. Further the study has also pointed out that there is strong volatility spillover relationship exists between Ghana stock market and exchange rate. The study of Carlos and Nguyen (2014) have discussed the essential behavior and some important global aspects between developing BRICS stock markets. The study has used regression test for the period of September 1997 to September 2013 and finds strong volatility spillover effect between US stock market as well as commodity market (S&P index, oil, and gold) and BRICS stock markets. From the beginning of some recent financial disasters, the impact remained frequently unbalanced. On the Other side BRICS stock market receipts no any effect through changing the economics rules of US state.

There is also some literature exists that opposed to these studies like Huang, Masulis, and Stoll (1996) study have insight on the importance of oil market. This study has examined relation among future oil returns and stock returns by using daily data for US economy. For data analysis the study has used time and lead lag correlations test and further disclosed that till the time of 1980, oil future returns and different stock indexes returns has no any relation among them. Similarly, Malik and Hammoudeh (2007) have examined the impact of volatility spillover between Worldwide crude oil markets, US stock markets and Gulf stock market i.e. Saudi Arabia, Kuwait and Bahrain by using multivariate GARCH (1, 1) model. The findings of the study concluded that Gulf stock market has volatility transmission effect except Saudi Arabia. However the study has argued that there is indirect relationship between all other stock markets and oil market.

The study of Salisu and Mobolaji (2013) have also examined the volatility transmission effect between oil market and US-Nigeria stock exchange market. The

results of the study have observed symptom of effective hedging and therefor, diversification of oil into a portfolio, will improve its (Nigeria stock exchange (FX)) risk-adjusted return performance. The linkage between oil and ethanol market has been examined by Hammoudeh, Li and Jeon (2003). The study has used different variables i.e. fuel prices, west Texas intermediate (WTI), gasoline and heating oil as a sample to calculate causality approach and volatility for numerous locations. The result of the study shows that all international markets and Gulf coast gasoline do have a volatility effect among them. The study of the Trujillo-Barrera, Mallory and Garcia (2011) have examined impact of volatility spillovers between energy and agricultural market for United States. The results of the study suggest that corn and ethanol market do have a strong volatility transmission from crude oil market due to fact that corn is used in biofuels production which in turn leads to increase the agriculture commodity prices similarly, Wu, Guan and Myers (2011) has also states that crude oil and corn prices have a strong volatility relation among them. For the data analysis the study employs different cross hedging approach that provides slight better hedging performance. Serra (2011) has observed a volatility spillover relation among crude oil, ethanol and sugar prices for Brazil by using semi parametric GARCH model. The study reports a strong volatility spillover relationship among these variables prices similarly, Trujillo-Barrera et al. (2012) further provide strong price variability and significant evidence of production of corn-based ethanol to test the volatility transmission among energy and agricultural markets.

To examine volatility transmission among oil and commodity markets Ji and Fan (2012) employs bivariate EGARCH model. The results of the study concluded that non-energy commodity market receive significant volatility spillover transfer from crude oil market. The study of Kristoufek, Janda and Zilberman (2012)

has analyzed the existence of volatility spillover relationship between biodiesel, ethanol, fuels and agricultural commodities markets. For the purpose of data analysis the study has used minimal time spanning and classifications. The results of the study show that in food crises of 2007/2008, Post-crises period relations are much stronger as compared to pre-crises period and provide evidence that biofuel is effected by food and fuel prices.Similarly, Babcock (2012) has examined the relation between US biofuel and biofuel polices. The results of the study suggest that till the time period of 2006 to 2009, US ethanol policies increased maize prices and suggest that these policies will be highly influenced under tight market conditions in future. The study conducted by Ali et al. (2013) have examined the impact of domestic and global biofuels policies on agriculture markets and food prices for Pakistan. GTAP model has been used for estimates. The results of the study indicate that by 2020, global policies on biofuels will be expressively affected the prices, production and trade of major crops. The study also shows that commodity market will take strongly effect from higher crude oil prices. Volatility spillover in oil, prices ethanol and corn prices for US economy are observed by Gardebroek and Hernandez, (2013) by using multivariate GARCH model for this specification. The study finds that in high-tech years, these variables i.e. ethanol and corn markets will have strong relations among them, for the most part of after 2006 when ethanol became the sole alternative for gasoline. Mensi et al.(2014) has used daily data for eight major commodities consisting (WTI oil, Europe Brent oil, gasoline, heating oil, barley, corn, sorghum and wheat). For the purpose of analysis the study has employed VAR-BEKK-GARCH and VARDCC-GARCH models and concluded that these energy and cereal markets do have a significant relation among them. The study has also give evidence that holding more diversified portfolios and to hedge the oil risk will be more effectively leads to improve its

risk adjusted performance.

Arouri and Rault (2012) have also discussed the relationship among two variables(stock markets and oil prices) in view of Gulf Cooperation Council (GCC) by employing panel cointigration techniques and seemingly unrelated regression (SUR) methods. The study has provided proof for cointigration among oil prices and stock prices whereas, the SUR method revealed results that oil prices have positive impact on stock prices except Saudi Arabia. The study also gives some future research avenues. First, oil and stock markets of GCC countries can be change industry to industry. Second the study suggests that causality link exist among these two variables. Chang and Su (2010) have examined the study for different biofuels consisting on bioethanol and biodiesel. The study has analyzed that whether economic stability can be produce or not in the period of oil shocks. To prove this study used Bivariate EGARCH model by using two variables (corn and soybean) for the period of January 2000 to July 2008.However, the findings of the study has pointed out that high oil prices greatly influenced on biofuels consumption.

The study of Arshad and Bashir (2015) have used some variables to examine the volatility between the oil and gas prices and stock returns of energy intensive industries in view of Pakistan. For the purpose of this investigation quarterly data of 3 energy intensive industries (chemicals, fertilizer, and textile) have obtained for the time period of 2009 to 2013.Using Multifactor model and panel regression analysis, the findings of the study stated that stock returns have negative impact from these variables i.e. oil prices, gas prices, exchange rate, and interest rate. However, the stock market index has significantly impact with positive coefficient. The findings of this study also give evidence that the investors should keep an eye on the variations of oil and gas prices in order to make sound investment portfolios

in Pakistan. Also, the policy makers and management of those industries should make effective plans to reduce their fuel costs. Sadorsky (2014) has employed four variables prices i.e. stock prices, copper prices, oil prices and wheat prices for the emerging market. To analyze volatilities and conditional correlations among these selected variables, the study used VARMA-AGARCH and DCCAGARCH models. The study argued that, for emerging market oil market compromises in economical hedge prices whereas copper is the most expensive but one should not put too much emphasis on average hedge ratios if it give the unpredictability in hedge ratios.

Jouini (2013) have examined the relationship between world oil prices and Saudi Arabia stock markets by employing VAR-GARCH model, as established by (Ling & McAleer, 2003). This study used weekly data for the period of 2007 to 2008 and argued that industries may not generally respond similarly to the oil shocks. The study also estimates portfolio optimal weights and hedge ratio that is based on VAR GARCH model. These findings having a great concern and effects for policy makers and market contributors. Chang et al. (2010) have examined the volatility spillover relation for four markets namely West Texas Intermediate (USA), Brent (North Sea), Dubai/Oman (Middle East) and Tapis (Asia-pacific). The study has used data for the period of April 1997 to November 2008 by employing three multivariate GARCH models, which include constant conditional correlation(CCC), Vector ARMA-GARCH (VARMA-GARCH) and vector ARMA-asymmetric GARCH (VARMA-AGARCH) models and provide evidence that there is positive relation exist between these countries. Similarly, Bekiros and Diks (2008) have examined the presence of linear and nonlinear causal connections among daily spot and futures prices for developments of one, two, three and four months of West Texas Intermediate (WTI) crude oil. The study has used data

for two period October 1991-october1999 and November 1999-october 2007 by applying Conventional linear Granger test , the results of the study indicate that spot and futures returns may show unequal GARCH effect and/or statistically significant higher order conditional moments.

Samanta and Zadeh (2012) have discussed co-movement among economic variables i.e. World Gold price, World oil price and real exchange rate for US dollar by using daily data for the period of twenty years. The results of the study suggest that there is possible presence of co-movement among these both variables. The study also indicates that Stock prices and gold prices are more volatile with each other however, oil prices and exchange rate is also affected by other variables as well. Ehrmann, Fratzscher and Rigobon (2011) have examined transmission of financial shocks for international and domestic market by using different variables included money, bond, stock market and exchange rate across different countries (USA and Europe) for the period of twenty years from 1989 to 2008. The study argued that to know about complex relation of these variables, policy makers and market participants need to take extensive time period. The findings of the Study stated that International cross market spillovers is significant.

Hammoudeh et al. (2009) have discussed study for dual aspects. The first aspect was that to observe three variables comprising on service, Banking, and insurance. The study has select Kuwait, Qatar, Saudi Arabia and UAE by employing VAR (1)-GARCH (1, 1) test. The other aspect was that by taking three countries; calculate optimal weights and hedge for the assets (two sector portfolio holdings).Results of the study discloses that except Qatar, each country has modest volatility spillover. On other hand, financial sector of Qatar, Saud Arabia, UAE and Kuwait favored by the optimal portfolio weights. The study of Harri and

Hudson (2009) based on its previous findings have examined cointegration relation exist among crude oil price, exchange rates and corn prices. On the basis of this study, shows importance of optimal hedge ratios. In the view of this fact the study has used comprehensive approach and covering two periods. The findings of the study argued there is no cointegration exists among crude oil prices and corn market in the period of April 2003 to March 2006 while in second time of period April 2006 to March 2009 the results of the study suggested that cointegration effect exist among both variables. This study has also provided some future avenues like examining the hedging effectiveness of futures contract for corn and other agricultural commodities.

With the respect of the literature in the context of exchange rate Jayasinghe and Tsui (2008) have discussed three factors in the prospective of exchange rate exposure. The factors which include volatility in exchange rate, due to sensitivity of stock returns. Volatility in foreign exchange rate caused by sensitivity of stock returns and volatility in exchange rate has correlation effect by change in stock returns. For this purpose, the study has been employed bivariate GJR-GARCH model concerning fourteen japan industrial sectors. The results of the study stated that exchange rate has significant relation among many sectors. The study has also suggested for direct implications in making investment decision and currency hedging for the sake of consultants. Similarly, Chiou and Lee (2009) study has differentiated the previous study in the context of oil and financial work. This study examine the stock returns that have irregular effect from oil prices and also show the importance of structure changes in this relationship by using daily data for oil transaction on the bases of S&P 500 index and West Texas Intermediate (WTI) for the period of January 1992 to November 2006. For the purpose of data analysis study employs ARJI (Autoregressive) test. The study found out that S&P returns

have effect from the unexpected high volatility in oil prices. For the purpose of to check mean and volatility spillover effect study Zhang et al. (2008) have employed different econometric approaches included cointegration, VAR model, and ARCH and Granger causality to examine the relationship between oil prices and US dollar exchange.

Kilian (2008) study proposes a new test of oil supply shocks. During financial crises only small portion of the oil prices increased and after five quarters, oil shocks affect sharp down on US real GDP growth. Since 1970, exogenous oil supply shocks made little difference for development of US economy. Wu et al. (2012) have examined the impact of exchange rate and stock market in the context of Asian emerging markets. To examine long term and short term variation this study has used main institutional changes included market liberalization and financial crises by employing autoregressive distributed lag (ARDL) approach. The results of the study suggest that during the crises period, strong relation volatility spillover effect among exchange rate and stock prices.

The study of Benhmad (2012) has examined relation of linear and nonlinear causality among real oil prices and real US dollars exchange rate. For the purpose of data analysis this study uses wavelet approach. The results of the study show that real US dollar has very strong bidirectional casual effect transfer from the real oil prices. Similar, to the study of Rapach and Strauss (2008) observe volatility spillover among exchange rate. The results of the study has suggested significant result for the period of 1980 to 2005.The study also state that in volatility, structural breaks is reliable method. Reboredo (2014) has conducted to evaluate volatility transmission among European Union allowances (EUA) and oil market by employing multivariate conditional autoregressive range. Kisaka and Mwasaru (2012) have examined the causal relationship between foreign exchange rates and

stock prices in Kenya from November 1993 to May 1999. The data set consisted on monthly observations of the NSE stock price index and the nominal Kenya shillings per US dollar exchange rates. The objective is to establish the causal linkages between leading prices in the foreign exchange market and the Nairobi Securities Exchange (NSE). The empirical results of the study suggested that foreign exchange rates and stock prices are non-stationary both in first differences and level forms, and the two variables are integrated of order one, in Kenya. Secondly, study has tested for cointigration between exchange rates and stock prices that provide evidence that the two variables i.e. stock prices and exchange rate are cointegrated. Thirdly, the study has been used error-correction models instead of the classical Granger-causality tests since the two variables have cointegrataion. The empirical results indicate that exchange rates Granger-causes stock prices in Kenya.

Abdullah and Kalim (2009) have conducted to examine the main factors of food prices inflation for Pakistan. For the purpose of data analysis the study employs johansens cointegration test. The results of the study suggest that the main factors caused of food inflation are both demand and supply similar to the study of Agha and Khan (2006) have examined the relationship between inflation and economic factors in Pakistan. The study employs VECM model and suggested that macroeconomic and fiscal implications should be considered and have close relation between these variables The study of Ahmad et al. (2014) have conducted to evaluate short and long run factors of inflation in Pakistan by using johansen cointegration technique. The study has employed data for the period of 1972-73 to 2012-13. The factors i.e. Consumer price index (CPI), exchange rate (ER), government borrowing (GB), non-Government Borrowing, real GNP (RGNP), indirect Taxes (IT), growth rate of money supply (GMS), import price index (IPI),

real demand, real supply and wheat support price (WSP) money supply (MS) are used in this study. The result of the study suggests that there is long run relationship between these different variables. In contrast, the study of Ahmed and Mustafa (2012) have examined relationship between inflation rate and real stock return. The study employs Fama (1981) methodology for the estimations. And argued that real stock return and inflation have negative relation, when real growth rate is controlled.

The relation between inflation and income inequality in Pakistan has examined by Ahmad and Ram (1991). This study also used the factors of foreign direct investment, workers remittances and manufacturing value added. For this purpose the study used annual data for the period of 1972 to 2007. Johansen cointegration approach and vector error correction models employ for short run and long run data analysis. The results of the study suggest that foreign direct investment and manufacturing value added have positive and significant relation for Pakistan economy growth. Ali (2014) has examined the volatility transmission between oil market and real exchange rate for Nigeria. The study has employs quarterly data for the period of 1986 to 2007. Johansen VAR-based cointegration technique approach is used for estimations. The results of the study suggest that oil market and increment in real exchange rate have positive effect on real economic growth in Nigeria. The study also suggest for greater diversification through investment to control volatility in exchange rate and oil market. Ansar and Asaghar (2013) have also examined the relationship among oil market , consumer price index (CPI) and stock market (KSE-100 index).For data analysis the study has used multi regression method. The results of the study suggest that oil prices, CPI and KSE-100 index have positive relation among them. The study of Ayyoub Chaudhry and Farooq (2011) has conducted to re-examine the relationship between inflation

and economic growth of Pakistan. The results of the study suggest that prevailing inflation is dangers for GDP growth of the economy. The study also suggest to policy makers and state bank of Pakistan to limited the inflation rate below 7 percent and keep it stable that will may help to have positive effect on economic growth of the Pakistan economy.

Ahmed et al. (2013) have discussed the long run and short run aspects of inflation for Pakistan. The study has been used annual data for the period of 1971 to 2012 by employing Johnson cointegration approach. The study also highlighted GDP, energy crises, import and current government expenditure. The study of Breitenfellner and Cuaresma, (2008) have discussed the impact of US dollar/euro exchange rate on crude oil prices.Bukhari and Khan, (2008) evaluate a developing economy by employing DSGE model for Pakistan.Evidently, it is concluded that there have been considerable body of research exist to examine influence of mean and volatility effect of world crude oil market on agricultural commodity market, exchange rate and stock market. The conclusions appear to be mixed. Some studies give evidence that world oil prices have influenced on agricultural commodity market, exchange rate and stock market. The difference may be arising from different time period, data set, methodologies and models. Furthermore, there are also some studies that give evidence of that negative relation among them. This study is an effort to fill the gap in the literature regarding mean and volatility transmissions between world oil prices, agricultural commodity market, exchange rate and stock market of Pakistan because there are not studies that have performed in the context of Pakistan by the use of these variables and model specification.

Chapter 3

Research Methodology

3.1   Data Description

The study examines the volatility transmission of oil prices (Crude Oil) to stock market, exchange rate and six different agriculture commodities (Corn, Wheat, Rice, Palm oil, Cotton and Sugar) in Pakistan market for the sample period of 21 years from 1997 to 2017. This study employs monthly closing prices data for agriculture commodities and exchange rate for the period of April 1997 to April 2017 while daily prices are used to examine the volatility transmission from oil to Pakistan equity market.

The data of stock index is collected from Pakistan stock exchange and yahoo finance website. Data for agriculture commodities prices (wheat, corn, sugar, palm oil, and rice) is collected from index mundi Pakistan website. Exchange rate of Pakistan from US Dollar data is collected from Oanda website.

3.2 Variable description

3.2.1 Crude oil

Crude oil is a liquid fuel source and it comes from the underground. After refining it is used as fuel in vehicles, machinery, fertilizers and other petroleum products. Crude oil prices measure the spot price of different barrels of oil in which WTI (West Taxes Intermediate or the Brent Blend are most common. WTI crude oil is very high quality oil because it contains low quantity of sulphur, light weight and sweet oil while Brent Blend is a combination of 15 different crude oil; it is less light and sweet than WTI. There are number of studies that have explored spillover effect from crude oil and agricultural markets, exchange rate, interest rates (Sadorsky, (2012); Arouri, jouini & Nguyen, 2013; Nazlioglu, Erdem & Soytas 2013).

The current study has employed monthly and daily data of crude oil for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(CU_t/CU_{t-1}) * 100 \qquad (3.1)$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

CU = current month index price of Crude oil

$CU_{t-1} = previous\ month\ index\ price\ of\ crude\ oil.$

3.2.2 Agriculture Commodities

3.2.2.1 Wheat

Pakistan basic natural resources are arable land and water. Wheat production in Pakistan, it is Asias third largest producer also export surplus of a few tons to other countries. The international grains council (IGC) reported that Pakistans total production is around about 6.6 million tons and it export at 4.3 tonnes of grains in 2016-17. In Pakistan, the most agricultural province is Punjab where wheat and cotton are most grown (Ismael & jabeen, 2014; Lyddon, 2017).

The current study has employed monthly data of wheat for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(Wh_t/Wh_{t-1}) * 100 \qquad (3.2)$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

Wh = current month index price of Wheat market

$Wh_{t-1} = previous\ month\ index\ price\ of\ Wheat\ market.$

3.2.2.2 Rice

In agriculture and national economy of Pakistan, rice production holds very important place because it produce an average of six million tonnes in each year. It is the worlds four largest producer of rice. Pakistan produces most famous variety of rice like (Basmati) because of its good flavor and quality. Sindh and Punjab

region grown crops and millions of farmers depended on rice farming as a main source of employment (Rice production, n.d.)

The current study has employed monthly data of Rice for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(Ri_t/Ri_{t-1}) * 100 \tag{3.3}$$

To make value bigger multiplies with 100. Where,

Ln= natural logarithm

Ri = current month index price of Rice market

$Ri_{t-1} = previous\ month\ index\ price\ of\ Ricemarket.$

3.2.2.3   Sugar

Sugar is an important cash crop in Pakistan. It is second largest agriculture based industry after textile industry.it also important in use of sugar, chipboard, paper, plastic, chemicals, paints and detergents. Major area of sugarcane is NWFP and Sindh. The industry of sugar plays an important role in poverty alleviation of the rural areas. It is an important daily use in every country of the world; about 165.801 million tonnes of sugar is consumed world widely. The estimated per capita consumption of sugar in Pakistan is 25 kgs per year. Production is around about 3.5 to 4 million of sugar. In Pakistan demand and supply of sugar is not balanced also Pakistan is not sugar exporting country; it imports sugar to meet domestic demand (Abbas, 2015; Zamad, 2009).

The current study has employed monthly data of sugar for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(Su_t/Su_{t-1}) * 100 \qquad (3.4)$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

Su = current month index price of sugar market

$Su_{t-1} = previous\ month\ index\ price\ of\ Sugar\ market.$

3.2.2.4 Corn

There are about 50 types of corn exist globally. In Pakistan, corn is fourth important largest grown crop after wheat, cotton and rice. Approximately one million hectare corn crops area with an annual production of 1.3 million tonnes. NWFP and Punjab is the major province for the production of corn. In Pakistan corn crop used for multipurpose food. Out of total production, around 60% is used in poultry feeds, 25% in industries and remaining percentage is used as food. Demand of corn is increasing day by day due to its uses as biofuels. Corn crop has proved to be a better and more profitable choice of farmers (Corn production, n.d.). The current study has employed monthly data of corn for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(Cor_t/Cor_{t-1}) * 100 \qquad (3.5)$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

Cor = current month index price of Corn market

$Cor_{t-1} = previous\ month\ index\ price\ of\ Corn\ market.$

3.2.2.5 Cotton

For the development of the country, cotton production is very important. Pakistan nation is highly depended on the cotton industry and textile sector .Pakistan hold third position in export of raw cotton.it is also known as largest exporter of cotton yarn. Total 979 ginning factories are currently operating in Sindh and Punjab. Both Sindh and Punjab recorded higher production of cotton. (Ishfaq, 2017).

The current study has employed monthly data of cotton for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(Cot_t/Cot_{t-1}) * 100 \qquad (3.6)$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

Cot = current month index price of cotton market

$Cot_{t-1} = previous\ month\ index\ price\ of\ Cotton\ market.$

3.2.2.6 Palm oil

Palm oil is an important plant for gaining eatable oil and other materials. This crop need hot sunshine and rainfall for grow. Farming of palm oil plant in Pakistan

can not only increase its beauty also decrease environmental pollution and can reduce annually imports expenses. Pakistan spent \$800million annually to import. Currently worldwide production is 22 million tons. Major palm oil producing countries are Malaysia, Indonesia, Nigeria and Colombia. Palm oil is used in cooking, food products like bakery, ice creams and chocolates. Palm oil is also used in soaps, candles, detergents, lubricant, fuel, cosmetics, and other personal products. Pakistan is one of the biggest consumers of palm oil. Every good Banaspati contain palm oil. It has been indicated that in near future more than 8000 acres of land in Sindh and Baluchistan would be bought for farming palm oil plant (Alam, 2005). The study of Kee et al.(2008) has found that palm oil is the most economical and sustainable source of food and biofuel in the world market.

The current study has employed monthly data of palm oil market for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(po_t/po_{t-1}) * 100 \tag{3.7}$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

po = current month index price of palm market

$po_{t-1} = previous\ month\ index\ price\ of\ Palm\ market.$

3.2.3   Exchange rate (RS/US\$)

Pakistan exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is

calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

The current study has employed monthly data of exchange rate for the period of April 1997 to April 2017 from index mundi Pakistan website.

$$Monthly\ index\ return = \ln(Ex_t/Ex_{t-1}) * 100 \tag{3.8}$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

Ex = current month index price of Exchange rate

$Ex_{t-1} = previous\ month\ index\ price\ of\ Exchange\ rate.$

3.2.4 Pakistan stock exchange

In Pakistan there are three stock exchange consisting on Karachi stock exchange, Islamabad stock exchange and Lahore stock exchange. It is incorporated in 1949 and located in Karachi and an index is KSE 100. Basically, through which investors and borrowers linked with each other is known as Stock exchange. In developed economy, stock exchange is common feature.

The current study has employed daily data of Pakistan stock exchange for the period of April 1997 to April 2017 from yahoo finance website.

$$Daily\ index\ return = \ln(Kse_t/KSe_{t-1}) * 100 \tag{3.9}$$

To make value bigger multiplies with 100.

Where,

Ln= natural logarithm

KSE = current month index price of KSE 100

$KSE_{t-1} = previous\ month\ index\ price\ of\ KSE\ 100.$

3.3 Methodology

3.3.1 Mean and Volatility spillover

The impact of oil prices (Crude Oil) volatility to stock market, exchange rate and to different Pakistan agriculture commodities prices is captured by using ARMA (1, 1) and GARCH (1, 1) model.

For employing this model first we need to justify the condition of existence of stationary data. ARMA (1, 1) and GARCH (1, 1) model is applied on oil prices to calculate the effect of information transmission from oil price to Pakistan stock market, Pakistan exchange rate from US dollar and to other Agriculture commodities.

$$\gamma_{j,t} = \lambda_0 + \lambda_1 \gamma_{j,t-1} + \lambda_2 \nu_{j,t} + \lambda_3 \varepsilon_{j,t-1} + \varepsilon_{j,t}, \varepsilon_{j,t} \sim N(0, \nu_{j,t}) \tag{3.10}$$

$$\nu_{j,t} = \Psi_0 + \Psi_1 \nu_{j,t-1} + \Psi_2 \varepsilon_{j,t-1}^2 \tag{3.11}$$

where,

$\gamma_{j,t}$ = Monthly return of other commodities prices at time t

λ_0 = Coefficient

λ_1 = Mean Garch term from a specific component

λ_2 = Mean Arch term from a specific component

λ_3 = Mean lag error term from a specific component

Φ_1 = lag error term from a specific component

Ψ_0 = Coefficient

Ψ_1 = Volatility Garch term from a specific component

Ψ_2 = Volatility Arch term from a specific component

In the second stage, mean return and volatility spillover effects to Pakistan stock market and on other agricultural commodities are estimated by mean and volatility equations of other commodities and Pakistan stock market as follows:

$$\gamma_{m,t} = \lambda_0 + \lambda_1 \gamma_{m,t-1} + \lambda_2 \nu_{m,t} + \lambda_3 \varepsilon_{m,t-1} + \varepsilon_{m,t}, \phi_1 \varepsilon_{j,t} + \varepsilon_{m,t}, \varepsilon_{m,t}, \sim N(0, \nu_{j,t}) \quad (3.12)$$

$$\nu_{j,t} = \psi_{j,0} + \psi_{j,1} \nu_{j,t-1} + \psi_{j,2} \varepsilon_{j,t-1}^2 + \Upsilon_j e_{k,t}^2 \quad (3.13)$$

Where,

m = is used to refer each equation refer to one each commodity and stock market

$\varepsilon_{j,t}$ = is the standardized residual series to capture the effect of oil prices to each commodity and stock market

$\varepsilon_{m,t}$ is calculated as $(\varepsilon_{j,t}/\nu_{j,t\cdot05})$ called garch series

$\gamma_{m,t}$ = Monthly return of other commodities prices at time t

λ_0 = Coefficient

$\lambda_1 = $ Mean Garch term from a specific component

$\lambda_2 = $ Mean Arch term from a specific component

$\lambda_3 = $ Mean lag error term from a specific component

$\Phi_1 = $ lag error term from a specific component

$\Psi_0 = $ Coefficient

$\Psi_1 = $ Volatility Garch term from a specific component

$\Psi_2 = $ Volatility Arch term from a specific component

$\Upsilon_2 = $ Volatility Lag error term from a specific component

Chapter 4

Results

4.1 Results and discussion

4.1.1 Discriptive statistics

Descriptive Statistics is use to describe the data behavior. The mean is the measure of central tendency and deviation from mean is reflected by standard deviation. Table 4.1 report results of descriptive statistics of all commodities, exchange rate and stock returns from April 1997 to April 2017 including mean (average monthly return) and standard deviation. Kurtosis, Skewness, Maximum loss in a month and maximum return earned in month.

TABLE 4.1: Descriptive statistics of Pakistan Agriculture Commodities, Stock market and exchange rate for the period of 1997-2017

Variables	RCR Monthly	RWH	RS	RR	RPO	RCOT	RCOR	RXR	RKSE Daily
Mean %	0.832	0.426	0.591	0.461	0.571	0.430	0.572	0.399	0.062
Std. Dev. %	8.811	6.388	8.049	5.968	7.459	5.793	5.919	1.543	1.472
Kurtosis	4.087	4.778	3.061	19.537	4.450	6.780	4.568	16.02	10.18
Skewness	-0.785	0.462	0.034	2.430	-0.063	-0.451	-0.034	1.837	-0.416
Maximum %	20.14	24.91	20.72	45.00	29.21	20.11	22.19	11.07	12.76
Minimum %	-30.07	-19.02	-26.10	-19.66	-27.78	-26.27	-20.76	-5.15	-13.21

Note: RCR= return of crude oil, RWH= return of wheat, RS= return of sugar, RR= return of Rice, RCOT= return of Cotton, RPO= return of Palm oil, RCOR= return of Corn, RXR= return of exchange rate, RKSE= return of KSE-100 index.

Table 4.1 exhibits the mean, median, standard deviation, Skewness and Kurtosis. The purpose is to investigate nature of return series of all commodities, exchange rate and stock market. The volatility is measured by standard deviation.

The above table indicates the average monthly return earned by crude oil market is 0.83% with a standard deviation of 8.811% which is higher than all commodity prices.it means that return of crude oil market is more volatile because crude oil is an important and well known commodity in international market. A shock in oil prices has high effect on other commodities and currencies. The maximum return earned during the sample period is 20.14% in a month and maximum loss is 30.07%. The oil returns are negatively skewed, because during the sample period the oil market long terms go down.

The average monthly return of wheat is 0.42%. In comparison to the crude oil market, the average return of wheat is lower as well as standard deviation is 6.3% which shows that wheat returns are less volatile. The maximum value is 24.9% and the minimum value is 19.1% which is also lower than crude oil market. The wheat returns are positively skewed because during the sample period wheat market moves in upward trend for long term. Whereas, Sugar market shows the monthly average returns of 0.59% which is lower than returns of crude oil market but little bit higher than wheat market. The standard deviation is found 8.04%, suggesting that sugar market returns are more volatile which is followed by wheat market but less than return of crude oil market. The maximum value is 20.7% and the minimum value is 26.1%. The sugar returns are positively skewed because during the period of 1997 to 2017, the sugar market continuously giving the clue of upward movement. Rice production plays a vital role in Pakistans agriculture economy. The average return earned by rice market is 0.46% which is lower in comparison to the crude oil and sugar market where as standard deviation is found 5.96% .

The maximum return earned during the sample period is 45% and the maximum loss is 19.6%. The rice returns are positively skewed because the rice market is remaining stable all over the sample period. Palm oil is an important commodity for gaining eatable oil in Pakistan. The average return earned by palm oil market is found 0.57% which is followed by wheat and rice market i.e. 0.42% and 0.46%. whereas the average return of crude oil and sugar market is higher. The standard deviation is 7.45% which indicates that after crude oil and sugar market, palm oil market is also highly volatile. Pakistan import huge amount of palm oil each year to use in the production of food, cosmetics and medicines. Increase in oil price may effect on its import due to fact of deficit in balance of trade. The maximum return earned in a given time period is 29.2% whereas the maximum loss is 27.7%. Palm oil returns are negatively skewed during the sample time period because the palm oil market is continuously decreases. Cotton is very important commodity in Pakistan because its export is highly depended on textile sector. The average return earned by cotton market is 0.43%, which is lower in comparison to crude oil, sugar, rice and palm oil market whereas standard deviation is found 5.79% lower than all other commodity market. The maximum return earned during the given period is 20.1% and the minimum loss is 20.2%. The returns of cotton market are negatively skewed during the sample time period because the cotton market is continuously drop down. Corn market is shows the average return earned in month is 0.572% which is followed by palm oil market i.e. 0.571% with the standard deviation of 5.91%. The maximum return earned in a month is 22.19 whereas the minimum loss is 20.7%. The returns of corn market are negatively skewed during the sample time period because the corn market is long term go down. Pakistan imports a huge amount of crude oil each year for daily consumption. The average return earned by exchange rate is 0.39% which is lower as compare to commodity

prices with the standard deviation of 1.54% suggesting that exchange rate is less volatile as compare to other commodity prices. The maximum return earned by exchange market is 11.07% and the maximum loss is 5.15%. The returns of exchange market are positively skewed during the sample time period because the exchange market is long term in upward trend. Stock market plays an important role in development of economic and financial sector of the country. In the case of Pakistan stock exchange, the daily average return earned by stock market is 0.06% which is lower in comparison to commodity prices whereas the average return of exchange market is higher. The standard deviation is 1.47%. The maximum return earned in a day is 12.76 in given time period whereas the maximum loss is 13.2%. The returns of stock market are negatively skewed during the sample time period because the stock market is long term in downward movement. Over all descriptive statistics show that the average returns of all agriculture commodities, exchange rate and stock market of Pakistan are observed positive. The average return of crude oil market is found maximum followed by sugar and corn market whereas the value of standard deviation for crude oil market is found maximum which is 8.811% indicates that crude oil market is more volatile whereas the average risk of Pakistan stock exchange is recorded minimum i.e. 1.472 % which shows that Pakistan stock exchange is less volatile in comparison to other commodity market. The maximum return earned in the year of 1997 to 2017 is 45% rice market and the maximum loss is in exchange rate. The data series is said to be normally distributed if the value of its skewness is close to zero. Wheat, sugar, rice and exchange rate are positively skewed and point out that in these variables higher positive returns (maximum extreme values) are dominate. The market of crude oil, palm oil, cotton, corn and stock exchange are negatively skewed which indicate large negative returns (minimum extreme values). The value of excess kurtosis

helps to analyze peak of the return series distribution. The return series of crude oil, commodity market, exchange rate and Pakistan stock market have indicates high kurtosis. Higher value of kurtosis indicates that the distributions of returns are leptokurtcic. A value of kurtosis greater than 3 indicates that there is high probability of having extreme values in the distributions. Whereas, a value less than 3 for kurtosis indicates that there is less probability of having extreme values in the distributions and platykurtically distributed. It concludes that the returns are skewed and leptokurtic. Return series of Pakistan market show non normal distribution which is the main characteristics of the data set of most emerging market (choudry, 1996).

TABLE 4.2: Augmented Dickey Fuller and Perron test at level and at first difference

Variables	ADF level	ADF 1st diff	PP level	PP 1st diff
Crude oil	-1.6532	-11.5963	-1.43469	-11.56376
Corn	-1.71501	-12.2288	-1.65583	-12.29297
Wheat	-1.70464	-12.2976	-1.07675	-12.14582
Sugar	-2.75711	-11.6922	-2.66337	-11.71275
Cotton	-2.8155	-9.9203	-2.62434	-9.946678
Palm Oil	-2.68246	-10.9848	-2.10482	-11.0931
Rice	-1.59879	-10.2204	-1.61346	-8.86751
Exchange rate	-2.07802	-7.52671	-2.26184	-9.853897
KSE	-2.07748	-37.8275	-2.16699	-68.07277
1% level	-3.99759	-3.99759	-3.99742	-3.997587
5% levely	-3.99759	-3.99759	-3.99742	-3.997587
10% level	-3.99759	-3.99759	-3.99742	-3.997587

The Table 4.2 is reporting ADF and PP tests Statistics results at level because their

values are less than critical values, but also show that data is stationary because reported values at first difference. Conversely, rejected the all null hypotheses in all series shows that at first difference all variables data is reporting stationary. In this study returns at first difference are used, so stationarity condition of ARMA model is satisfied. The result calculated from mean spillover and volatility spillover take effects as modeled by ARMA (1, 1)-GARCH (1, 1) from crude oil market to Pakistan Stock market, exchange rate of Pakistan and to other six Agricultural Commodities.

TABLE 4.3: Table 4.2 : Mean and Volatility spillover from crude oil market to Pakistan Stock Exchange and to Other Agricultural commodities returns estimated from ARMA (1, 1)- GARCH (1,1) MODEL on Monthly return for the period of 1997 to 2017

Variables	Crude oil	Wheat	Sugar	Cotton	Rice	Palm oil	Exchange Rate
λ_0	2.405322	-0.76293	-1.03484	1.34405	0.283748	0.686685	-0.005214
	(0.0373)	(0.7062)	(0.3545)	(0.0085)	(0.4647)	(0.4581)	(0.9348)
λ_1	0.142081	-0.03046	0.166738	0.0036	-0.17699	-0.27065	0.575287
	(0.497)	(0.9157)	(0.4958)	(0.9845)	(0.4454)	(0.222)	(0.0003)
λ_2	(0.5021)	(0.5373)	(0.2299)	(0.1733)	(0.9252)	(0.7361)	(0.0438)
	(0.5021)	(0.5373)	(0.2299)	(0.1733)	(0.9252)	(0.7361)	(0.0438)
λ_3	0.054507	0.251898	0.076097	0.377022	0.566582	0.630271	-0.309155
	(0.8035)	(0.3931)	(0.7627)	(0.06)	(0.0319)	(0.008)	(0.059)
Φ_1		0.148347	0.101624	0.110122	0.026517	0.184279	0.019813
		(0.0012)	(0.0985)	(0.0024)	(0.362)	(0.0016)	(0.0005)
ψ_0	68.43679	5.688671	-1.1693	2.041529	3.427089	1.113892	0.126368
	(0.00000)	(0.0717)	(0.0855)	(0.1552)	(0.0094)	(0.5786)	(0.0002)
ψ_1	-0.326747	0.85442	0.987947	0.671626	0.554067	0.812016	0.178424
	(0.0245)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0058)
ψ_2	0.411746	0.03201	-0.02148	0.217648	0.34208	0.054513	1.035476
	(0.0021)	(0.2647)	(0.1644)	(0.0038)	(0.0005)	(0.2386)	(0.0000)
ϕ_2		-1.37621	3.35984	0.763429	-0.54069	5.022246	0.219691
		(0.2008)	(0.0000)	(0.41)	(0.3975)	(0.0449)	(0.0000)

Note: The numbers in parentheses are p-values.

The results of Table 4.3 report the mean and volatility spillover effect from the world crude oil market to six different agriculture commodities and exchange rate (RS/US$) by using GARCH-M model. This model captured the impact of past prices volatility effect on current prices volatility. The ARCH and GARCH term of crude oil is found positive and significant; it indicates that past price behavior of the crude oil markets are transmitted into current price behavior whereas the sum of ARCH and GARCH term is closed to one which indicates that the persistence of volatility is long-term in nature.

In wheat market Φ_1 is significant i.e. 0.0012 which specifies the presence of mean spillover effect from crude oil market into wheat market. The effect is seen to be significant and positive in nature suggesting that returns of wheat are influenced. Therefore mean spillover transmitted whereas volatility spillover Φ_2 is insignificant in this case i.e. 0.201. It means that information created in crude oil market in view of oil shocks has affected the returns of wheat however does not transmitted into volatility of wheat market. Persistence of volatility is also observed as GARCH term is significant and persistence is in long run as sum of ARCH i.e. 0.854 and GARCH term i.e. 0.032 is closer to one i.e. 0.889. Similarly, in cotton market mean spillover effects are transmitted from crude oil market that is 0.002, whereas the volatility spillover does not exist i.e. 0.397. The sum of ARCH and GARCH term is closed to 1 which indicates that the persistence of volatility is long-term in nature.

The sugar market has significant mean spillover effect 0.0095 that is 99% confidence interval reflects a significance level of 0.01 whereas the effect of volatility spillover is also positive and suggesting that information significantly transmitted into sugar market from crude oil market. It is also noticed that GARCH term is positive and significant. The sum of ARCH and GARCH term is closed to one i.e. 0.966 which

indicates that the persistence of volatility is long run in nature.Same interpretation applies to palm oil market. Palm oil market also observed that mean and volatility spillover are significantly affected from the crude oil market. Both effects are positive i.e. 0.0016 and 0.0449 which indicates that past price behavior has an effect on current period volatility so; oil market shocks affect the palm oil market significantly and positively. The study of Kee et al.(2008) has found that palm oil is the most economical and sustainable source of food and biofuel in the world market. The sum of ARCH and GARCH term is closed to 1 which indicates that the persistence of volatility is long-term in nature.

In case of exchange rate mean spillover is significant and positive i.e. 0.0005 whereas volatility spillover effect is also observed significant in both cases which indicates that information transmission among oil market and exchange rate not only effect the returns but also effect on volatility. The sum of ARCH and GARCH term is greater than one i.e. 1.213 Which indicates that the persistence of volatility is long-term in nature for exchange rate However, the mean and volatility spillover of rice is insignificant in both cases. So results concluded that any changes in the price of crude oil in view of oil shocks have significantly affect the sugar, palm oil and exchange rate markets. As the study of Malik (2008) has analyzed that generally oil importing countries has affected by change in world oil prices. This study has also indicates that oil is used as input in production process, to generate electricity, in machineries and fertilizer, in transportation as (fuel) so, any change in oil price will have effect on agriculture commodities as well.

The results of corn market cannot be reported because the condition of data stationary for applying this model is not fulfilled; the returns are not hetroskedastic in volatility spillover of corn market. So, the study has not applied the ARMA (1, 1) and GARCH (1, 1) model for this commodity market

TABLE 4.4: Mean and Volatility spillover from crude oil market to Pakistan Stock Exchange returns estimated from ARMA (1, 1)- GARCH (1,1) MODEL on Daily return for the period of 1st July 1997 to 31 August 2017

Variables	Crude oil	KSE
λ_0	-0.005514	0.062377
	(0.9001)	(0.0244)
λ_1	0.17121	0.417555
	(0.8583)	(0.0095)
λ_2	0.013634	0.003102
	(0.451)	(0.8145)
λ_3	-0.157421	-0.331169
	(0.8696)	(0.0408)
Φ_1		0.01004
		(0.1264)
ψ_0	0.017838	0.026353
	(0.0001)	(0.0000)
ψ_1	0.948816	0.841893
	(0.0000)	(0.0000)
ψ_2	0.049928	0.141239
	(0.0000)	(0.0000)
ϕ_2		0.023481
		(0.0000)

Note: The numbers in parentheses are p-values.

The results of Table 4.4 report the mean and volatility spillover effect from the crude oil market to Pakistan stock exchange market using GARCH-M model. The mean spillover Φ_1 i.e. 0.1264 is positive and insignificant for Pakistan equity market. These results suggest that information created in oil stocks in form of oil shocks have not effect on the Pakistan equity returns However, the volatility spillover from crude oil to stock exchange market result shows the positive and significant which indicates that volatility in world crude oil prices transmits into the volatility of Pakistan stock market. The ARCH and GARCH term of crude oil is found positive and significant; it specifies that past price behavior of the crude oil markets are transmitted into current price behavior whereas, the sum of ARCH and GARCH term is also observed closed to one i.e. 0.983 which point out that the persistence of volatility is long term in nature. It means that stock market of Pakistan is also influenced by world crude oil shocks. because in an economy organizations earnings and cash flow streams are directly affected from world Oil prices movement. The study of Sadorsky (2014) employs four variables prices (stock prices, copper prices, oil prices and wheat prices) for emerging market. This study shows a strong volatility transmission between oil market and emerging stock markets. Another study of Ansar and Asaghar (2013) has also examined the relationship among oil market , consumer price index (CPI) and stock market (KSE-100 index). The results of the study suggest that oil prices, CPI and KSE-100 index have positive relation among them.

4.1.2 Discussion

There are many studies that have explored spillover effects between crude oil and agriculture commodities, focusing on exchange rate, stock markets and other

macro economy factors (Skintzi & Refenes, 2006; Arouri, jouini & Nguyen, 2011; Aloui, 2007; Elmarzougui & Larue. 2013).

According to the results in Pakistan, returns of wheat market have received significant effect from the crude oil market whereas volatility spillover effect from crude oil is insignificant. This in fact is expected due to the fact that increase in oil price may affect the production of wheat which is used as input such as fuel which in turn leads to increase the prices of wheat and its relative products similarly returns of Cotton market has also received significant mean spillover effect from the crude oil market whilst volatility spillover effect from crude oil is insignificant in Cotton market. As cotton is very important commodity in Pakistan because its export is highly depended on textile sector. The production of cotton market affected by oil shocks due to fact that oil is used as input in transportation, machineries and fertilizers which leads to increase the price of yarn and subsequently the price of fabrics. Positive and insignificant spillover suggests that wheat and cotton market are not affected by volatility in crude oil market. Saghaian (2010) has analyzed causal relationships across five US price series i.e. corn, soybeans, wheat, ethanol and crude oil. The study has obtained mixed results and also indicated that there were no volatility transmission between energy and agricultural markets. However, results of Granger causality tests indicated crude oil prices Granger cause corn, soybeans, and wheat prices.

In case of Rice market, information created in oil stocks in form of oil shocks has not affected on the returns of rice market neither the volatility of the rice market. It means that there is no mean and volatility relation exist between rice and crude oil market. High oil prices may affect the production of rice and lead to increase in its prices. The sugar market has significant mean spillover effect 0.0095 that is significant on the confident level of 99% whereas the volatility of crude oil market

spillover is also positive and significantly transmitted into the volatility of sugar market. Positive and significant volatility shows that due to any fluctuation in crude oil market sugar market is also strongly affected.

Palm oil market is also observed mean and volatility spillover effect from the crude oil market. Both effects are positive. A country with high crude oil price have less spending to import palm oil from other exporting countries because Pakistan import huge amount of palm oil each year to use in the production of food, cosmetics and medicines. High oil price may effect on its import level due to fact of deficit in balance of trade. The study of Kee et al.(2008) has found that palm oil is the most economical and sustainable source of food and biofuel in the world market.

There are mixed evidences about the transmission variation from crude oil market into agriculture commodity markets. Evidence by Nazlioglu and Soytas (2012) observed positive volatility transmission between crude oil market and agricultural commodity market. Liu (2014) has also examined volatility transmission effect among crude oil and agricultural commodity markets and concluded that agricultural commodity markets do have volatility transmission from crude oil market. While, Zhang et al. (2010) argued that oil shocks do not have direct impact on agricultural commodity prices. Gilbert (2010) has contended that there is no volatility transmission among crude oil market to agricultural markets. The study of Esmaeili and Shokoohi (2011) has also discovered that food prices have indirect effect from oil prices. In this study overall results of commodity market concluded that there is only Wheat, cotton and rice market are the markets that have no volatility transmission effect from crude oil market Whereas all other commodities receive volatility transmission from crude oil market. Results states that any change in world oil prices will directly effect on Pakistan agriculture commodity

market. Further, when the prices of crude oil will increase, production cost i.e. transportation cost, input cost will be also increased.so automatically it directly effect on agricultural sector for Pakistan as oil importing countries (Malik, 2008; Apergis & Rezitis, 2003; Khiyavi et al. 2012).

Volatility spillover relation between crude oil and exchange market is also examined by many studies (Najaf & Najaf, 2016; Shair, 2015). This study results states that exchange rate has received significant positive mean and spillover effect from the crude oil that shows information transmition is highly transmitted from crude oil market into exchange market. As Pakistan import crude oil from other exporting countries so any change in crude oil prices has directly effect on Pakistan exchange rate because high oil prices lead to expensive imports, imports become more than exports ,balance of payment will show budget deficit and vice versa (Malik, 2008). Messe and Rose (1983) study has examine the relation among interest rate and exchange rate. As exchange rate go higher, foreign investor get more attracted, this attractiveness convert the balance of payment in surplus so domestic currency have more valued. Further, due to inflation exchange rate decline in the country, because inflation force investor to move and invest their profits out of the country. Domestic currency devalued when foreign currency demand increased. The study of Obadan (2006) has been discussed that variations and insecurities known as Volatility in term of asset pricing, portfolio optimization and risk management. Pakistan is based on agriculture trading and gradually moving to mechanization. It produces agriculture based crops like rice, wheat corn, vegetables and fruits and export to other country. So over all discussion states that fluctuation in oil prices can directly effect on whole economy of Pakistan. Wu et al. (2012) has tested the comovement of exchange rate and stock market in the context of Asian emerging markets. The results of the study suggest that during the crises period strong

volatility spillover exist among exchange rate and stock prices.

However, Volatility transmission between crude oil market and stock markets is also explored by some studies. In this study stock market of Pakistan is also influenced by world crude oil prices because in an economy organizations earnings and cash flow streams are directly affected by change in world Oil prices as above discussed that high oil prices makes high input costs, production cost which produce less earnings for the organization, share prices go down. Moreover decline in shares prices may lead to reduction in firms profits and dividends. Domestic and foreign investors will not attract for investments. Whereas, decreases in oil price show low input cost and makes increment in earnings and more investments (Ahmad & Ram, 1991). The study of Arshad and Bashir (2015) have selected some variables to look over on the control of oil and gas prices on the stock returns of energy intensive industries of Pakistan. The study finds that stock returns takes negative impact from these variables (oil prices, gas prices, exchange rate, and interest rate). However, the stock market index was significantly impact. The findings of this study suggest that the investors should keep an eye on the changes of oil and gas prices in order to make sound investment portfolios in Pakistan. Also, the policy makers and management of those industries should make effective plans to reduce their fuel costs.

Furthermore, increases in world oil prices also lead to inflation in an economy (Ahamad et al. 2013; Ayoub choudary & Farooq, 2011). The increase in inflation rate cause to increase in interest rate that makes difficulties for investors to survive in the market. Jebabli, Arouri and Teulon (2014) Studies conclude that expected inflation can either positively or negatively impact stocks, depending on the ability to hedge and the governments monetary policy. The study of Adiqa (2018) has concluded that less government consumptions, a higher real stock prices and low

interest rate would increase the real output of Pakistan. Another study of Fazal-e-haider (2007) has discussed that the Baluchistan, the province of Pakistan is rich in gas and oil resources. The largest (PPL) production of petroleum and Exploration Company of Pakistan has been leading the oil and gas resources for many years in the province.

Chapter 5

Discussion and Conclusion

5.0.3   Conclusion

Pakistan is considered as oil importing country and it imports huge amount of crude oil each year from international oil export countries. Oil price volatility effect individual, organization and as well as whole economy lifespan. Agricultural commodities are the fundamental and the essential requirement for the human being, any fluctuation in these products costs, has affected overall the economy. Many studies have been conducted to check relation among oil prices volatility, stock exchange and exchange rate but there are few researchers conducted in the context of Pakistan.The purpose of this study is to examine the mean and volatility spillover effect of world oil market (Crude Oil) on stock market, exchange rate and six different Pakistan agriculture commodities (Corn, Wheat, Rice, Palm oil, Cotton and Sugar) for Pakistan by using ARMA (1, 1) and GARCH (1, 1) model.

The sample period is 21 years from 1997 to 2017. This study employs the data of monthly closing prices for agriculture commodities and exchange rate, from the period of April 1997 to April 2017 whereas daily closing prices are used for Pakistan equity market for the period of 1st July 1997 to 31 August 2017.

The results of the study suggest that the conditional mean returns and the volatility of the agricultural commodity market, exchange rate and stock market in Pakistan are influenced by the world crude oil market. The findings of the study indicate that the volatility is transmitted to the returns of exchange rate and different commodities include wheat, palm oil, and cotton. Furthermore, the volatility spillover is also observed from crude oil to exchange rate, equity market, sugar and palm oil. Based on the results, it is concluded that agriculture commodities are influenced by world oil market this shows that in oil importing countries like Pakistan, fluctuation in world oil market is extremely influenced on agriculture segments because most of the fuel is used by farmers, transporters, heavy machineries and fertilizers which is indirectly pay by consumer, and effect on their household budget through increase in commodity prices. Due to fluctuation in these products prices, has directly affected the whole economy, it reduces the purchasing power of the people i.e. farmers, consumers, organizations, investors and they are unable to avail their many basic needs and in turn it leads to inflation in the country. Rice, wheat and cotton markets are the only markets for which there is insignificant relationship for the volatility spillover effects from world oil market.However, these commodities are the largest exporting crops in Pakistan this suggests that these crops are may not influenced by oil prices (Malik, 2008).

The results for the mean and volatility spillover of exchange rate indicate that exchange rate is greatly influenced by world oil market. This implies that fluctuation in world oil market are influenced negatively the balance of payments and budgetary position of Pakistan. The study of Malik (2008) has analyzed that generally oil importing countries has affected by fluctuation in crude oil market. Equity market of Pakistan is also influenced by world crude oil prices because organizations earnings and cash flow streams are directly affected by change in world

Oil prices as above discussed that high oil prices makes high input costs, production cost which produce less earnings for the organization, share prices go down. Further decline in shares prices may lead to reduction in firms profits and dividends. Domestic and foreign investors will not attract for investments. Whereas, decreases in oil price show low input cost and makes increment in earnings and more investments. Moreover, increases in world oil prices also lead to inflation in an economy that cause of increase in interest rate and makes difficulties for investors to survive in the market. So, this study concludes that mean and volatility spillover from crude oil market to stock market could be observed. This study also shows the important information that will help to policy makers and investor to make better decision and earn more profit.

5.0.4 Recommendations

After concluding all findings this study recommended that investors, economists and policy makers needs to keep an eye on information that being transmitted from world oil market. On the basis of results this study suggest that some countries reduces their consumption level of oil to balance their budget but it is only possible when other alternatives are available and continuously make effort to balance the production and consumption (import and export) level. As Pakistan is currently facing very serious energy shortage, oil consumption is increasing steadily. Government should need to provide some facilities to farmers for electricity consumptions, to transporters for fuel consumption and help poor people to balance their family budget also. No doubt, Pakistan fiscal and monetary economists are working hard to stabilize the economy but still more efforts are needed to enhance the overall economy growth.

5.0.5 Directions for future research

As debated, previously there are studies that look over relation among oil volatility which are conducted on different macroeconomic variables. This study is conducted by considering agriculture commodities, stock market and exchange rate of Pakistan. By using same model, and considering other various agriculture commodities or any other economic variable may be tested on emerging countries.

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