CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

Mean and Volatility Spillovers of Crude Oil on Food Sector Stock Indices in Oil Importing and Oil Exporting Countries

by

Ayesha Dildar

A thesis submitted in partial fulfillment for the degree of Master of Science

in the

Faculty of Management & Social Sciences
Department of Management Sciences

2020

This postulation is dedicated to my parents and teachers, who are constantly a light for me in obscurity and their unflinching help, guided my unfocused words into Sound thoughts

CERTIFICATE OF APPROVAL

Mean and Volatility Spillovers of Crude Oil on Food Sector Stock Indices in Oil Importing and Oil Exporting Countries

by

Ayesha Dildar

(MMS173004)

THESIS EXAMINING COMMITTEE

S. No.	Examiner	Name	Organization
(a)	External Examiner	Dr. Ahmad Fraz	PIDE, Islamabad
(b)	Internal Examiner	Dr. Arshad Hassan	CUST, Islamabad
(c)	Supervisor	Dr. Nousheen Tariq Bhutta	CUST, Islamabad

Dr. Nousheen Tariq Bhutta
Thesis Supervisor
September, 2020

Dr. Mueen Aizaz Zafar
Head
Dept. of Management Sciences
September, 2020

Dr. Arshad Hassan
Dean
Faculty of Management & Social Sciences
September, 2020

Author's Declaration

I, **Ayesha Dildar,** hereby state that my MS thesis titled "**Mean and Volatility Spillovers of Crude Oil on Food Sector Stock Indices in Oil Importing and Oil Exporting Countries**" is my own work and has not been previously submitted by me anywhere else for taking any degree. At any time if my statement is found to be incorrect even after my graduation, the University has the right to withdraw my MS Degree.

(Ayesha Dildar)
Registration No: (MMS173004)

Plagiarism Undertaking

I solemnly declare that research work presented in this thesis titled "**Mean and Volatility Spillovers of Crude Oil on Food Sector Stock Indices in Oil Importing and Oil Exporting Countries**" is exclusively my research work with no remarkable contribution from any other individual. Small contribution/help wherever taken has been dully acknowledged and that complete thesis has been written by me.

I understand the zero tolerance policy of the Higher Education Commission and CUST towards plagiarism. Therefore, I as an author of the above titled thesis declare that no part of my thesis has been plagiarized and any material used as reference is properly cited.

I undertake that if I am found guilty of any formal plagiarism in the above titled thesis even after award of MS Degree, the University reserves the right to withdraw/revoke my MS degree and that HEC and the University have the right to publish my name on the HEC/University website on which names of students are placed who submitted plagiarized work.

(Ayesha Dildar)

Registration No: (MMS173004)

Acknowledgements

In the Name of Allah, The Most Gracious, The Most Merciful. Praise be to God, the Cherisher and Sustainer of the worlds. All thanks to Almighty Allah, The Lord of all that exist, who bestowed me with His greatest blessing i.e. knowledge and Wisdom to accomplish my task successfully.

Thousands of salutations and benedictions to the Holy prophet **Hazrat Muhammad (PBUH)** the chosen-through by whom grace the sacred Quran was descended from the Most High. I am very thankful to **Dr. Nousheen Tariq Bhutta**, a great teacher, mentor and supervisor who made a difference in all aspect of my life. I am indebted to **Dr. Nousheen Tariq Bhutta** for her valuable guidance, encouragement and dedicated support that enabled me to complete my MS Degree Program. I want to express my heartiest regards to my parents who always supported me morally, spiritually & prayed for my success.

(Ayesha Dildar)

Registration No: (MMS173004)

Abstract

The purpose of this study is to investigate the mean and volatility spillovers of crude oil on food sector in oil importing and oil exporting countries. The study employs the daily data of oil prices and food sector stock Indexes of 6 countries three from oil importing sector and three from oil exporting sector. Index for food sector of oil importing and oil exporting countries is created by taking food processing companies of three oil importing and exporting countries is taken. For Canada the food processing companies taken to calculate the stock index include Roger Sugar Inc., George Weston Limited, and Maple Leaf Foods, Premium Brand Holding, Saputo Inc... For China the companies taken include china foods limited, china menguin dairy foods, china yili group, dachan foods, global sweetners, and imperial pacific international holdings. For India the companies include Hatsan Agro, India LT Foods, KRBL Inc., Vadilalind Inc. For Saudi Arabia the companies include Alamrai Co., Saudi Arabia NATF ltd., and Savoula group. For US the companies include Constellation Brands, Flowers Food Inc., Hershey Co., Molson Coors Beverages, Tree House Foods, and US TSN Foods. For Kuwait the companies include Sultan Centre Food Products Company SCFK only. Daily stock prices of all these companies is taken form the website www.investing.com and www.finance.yahoo.com. Return and volatility spillover is measured by using ARMA (1,1) GARCH (1,1)-M model. Moreover, the time-varying nature of conditional correlation is further explored by using DCC-ADCC models for both aspects as well. The findings of the study provide strong evidence of volatility transmission from oil prices to food sector stock indices of oil exporting and oil importing countries but limited evidence is found regarding return spillover. However, there found return and volatility spillover across different countries for the given time period which indicates the limited evidences of diversification. In addition, DCC GARCH also reveals the time varying nature of conditional correlation. The results also show the presence of asymmetric behavior among different countries.

Keywords: Mean & Volatility Spillovers, DCC, ADCC & Oil Exporting & Oil Importing Countries.

Contents

List of Tables

Abbreviations

ADCC	Asymmetric Dynamic Conditional Correlations
ARMA-GARCH	Autoregressive Moving Averages GARCH
CCC	Constant Conditional Correlations
DCC	Dynamic Conditional Correlations
EMH	Efficient Market Hypothesis
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GARCH-M	Generalized Autoregressive Conditional Heteroscedasticity in Mean
GJR-GARCH	Glosten-Jagannathan-Runkle GARCH
MV-GARCH	Multivariate GARCH

Chapter 1

Introduction

Over the last few decades, the food sector in oil importing and exporting countries has experienced a dramatic interface with one another, encompassing significant swings and fluctuates. The uphill drive in oil & food prices caught attention during the era of 2000s towards the flow of information mechanism prevalent among the two markets (Kaltalioglu, Soytas, 2011).

Very few studies have tried to explore the impact of variation in oil-value on resource costs, for instance, stock costs. Market members look for a system that embarks on to differentiate variation in oil-value variation that impacts stock costs or returns generated through financial exchange. Hypothetically, oil-cost shocks impact financial exchange based returns or impact anticipated income through costs (D. W. Jones, Leiby, & Paik, 2004).

The global economy is influenced by different channels subsequent of rise in oil costs, as an instance, change in resources takes place among oil importing and oil trading realms, rise in cost accruing on creating products as well as enterprises, financial markets, growth as well as buyer certainty.

Prior to this, the significant downward spiral fundamentally indicated rise in oil costs following World War-II (Hamilton, 1983). These outcomes provided support to a number of research studies that apprised variations in oil value reflect impact through monetary indicators (Gisser & Goodwin, 1986). Earlier, an extensive range of studies worked on to find correlation between oil costs on larger scale and financial markets (Bruno & Sachs, 1982) in the UK.

Developed countries show heavy reliance on oil, and related imports. Hence, political events, such as, oil embargo, and community-based value system in relation to the oil exporting countries could impact the financial settings in these countries. This research study retorts to investigate the volatility spillover between world oil, and food price indexes. However, a study found no volatility spillover linked with the oil returns towards the food returns. World food prices saw rising trend simultaneously with oil prices during the 2000s, it triggered an augmented concern for transmitting information forces at work between these the two markets.

These commodity markets provide an alternate investment areas, actuality and course of spillovers those are prudently assessed by investors. The presence and extent of the connection among alternate investments is likely to know the degree of involvement of investors with regard to each market for the purpose of risk management.

According to an inference, food prices reflected hike recently may be attributed to escalating energy prices that let the food prices towards upward. This argument is based on the fact that energy has a valuable input in food activities. The connection between energy and food markets may look extra complicated. A feedback mechanism may unveil that hike of food prices may drive the energy prices. A mechanism of this kind is likely to exist in form of using some of food items used for energy generations, in other words, it contributes to raise energy demand that pushes the oil prices along with food prices. This necessitates the need to understand the link between food items and oil price market and look for a feasible method that could unveil the black box in this dynamic relationship as required under Agricultural Trade Policy. An analysis in this direction leads to state that during the period during 2005-2007 production of biodiesel went up to 5.5 million tones. Moreover, Collins, (2008) further added that maize prices went up to 60% during 2006-2008; this rise is attributed to use of maize in production of ethanol. It leads to assume that rise in response for bio-energy may cause rise in food prices and tendency to seek substitutes of conventional fossil fuels. If this assumption holds well; it can be expected that food prices prevalent in the world may lead the oil prices. However, rise in food prices may not cling with food items widely used

in the production of bio-fuel. There is also an escalating trend in item prices of food consumption. It is worthwhile to mention that there are scarce studies that has attempted to investigate the link of world oil with food consumption of item prices. This research study has made a unique attempt to investigate the volatility spillover among world oil and food markets. By adopting a comparatively new methodology, we get the ability to test causality to find whether volatility spillover exists in oil prices as a result of food consumption shown on index of item price. Moreover, the oil market has no feedback to this effect. The projected results may deliver implications for policy framers and local and global investors those keep an eye on the price stocks and look for transmission mechanism for the purpose of alternate investment.

A lot of literature is available pertaining to transmission of information among commodity markets. With the view to remain concise, we focused the studies pertaining to the food and oil prices. A study conducted by (Coyle, Gehlhar, Hertel, Wnag and Yu, 1998) examined the structural changes occurring around food market and raised argument that the changes linked with the food market is accompanied by the production process that involves food as a major input force in the system.

It was found that the rise in prices is due to escalating response for maize employed in the production of ethanol as well as raised response for rapeseed utilized in production of biodiesel. Statement of Chief Economist of the USDA emphasizes that plentiful hike in farm prices relating to maize as well as soybeans seeks its attribution with production of bio-fuel (Glauber, 2008). A number of studies examined transmission among food markets stresses that in Greece, both farm as well as retail prices significantly effects each other.

Effects of volatility spillover do exist among producer as well as consumer prices. Another study conducted by Christian and Rashad, (2009) investigated the high food prices during the period from 1950-2005 and reported reduction in farm value linked with retail prices. Vavra and Goodwin, (2005) investigated the relationship of retail as well as consumer prices reflected by food items and found development of asymmetric effects as a result thereof price changes. It was found that as retail

prices decrease, consumer prices showed downward trend as well.

Besides, the relations among retail as well as farm prices does not show concurrency but with a gap in time. A former study found that rise in wholesale prices significantly transmits the change in retail prices during the span of similar week (Minten and Kyle, 2000).

(Aksoy and Isik-Dikmelik, 2008) found that commodity prices confront changes more significantly in countries where people rely on staple food instead of variety of foods since consuming staple crops influences the domestic expenses. Based on these findings, it was inferred that the rise in prices of the staple crop food significantly affects the domestic welfare.

Since there are less studies on defining the relations among world consumption of food items and oil prices, the literature on volatility spillover with regard to behavior of different commodity markets was examined in the perspective of using different methods.

Worthington et al. (2008) applied MGARCH method to conduct analysis of transmission prices as well as price volatility in spot markets of Australian electricity. A research study conducted by Fan et al. (2008) looked for the spillover effect among two markets, WTI (West Texas Intermediate crude oil) and (BCOS) Brent crude oil spot markets. The study applied GED-GARCH method to make estimation of the conditional heteroscedasticity and signal towards two way Granger causality.

Plenty of studies have studied spillover effects on role of energy in futures markets. Minten and Kyle, (2000) contended that rise in consumer prices is associated with rise in prices of crude oil. It was pointed that if the industrial production increases; it is likely that oil prices may see escalation in prices of oil. It was established that despite tremendous rise in prices of oil, it does not affect demand of commodities despite the low elasticity. This means that rise in oil price is not going to affect demand of food commodities.

As global food markets give free chance to investors as well as speculators, as in the case of the oil markets, similar dynamics govern the prices in both of commodity markets. Prices of food, and oil like commodity prices were vastly examined in the pertinent literature. However, literature reveals a scanty studies to the knowledge

of the researcher that examined the mean and volatility link among world food as well as oil prices. This research study deals with the mean and spillover effects among food consuming items, as well as oil prices.

Small-scale variations in the cost of oil emerges as an elementary factor in creating process, influencing financial implementation or income stimulation as well as value costs (Huang, Masulis, & Stoll, 1996). (Yurtsever & Zahor, 2007) similarly supported a number of theories, for example, oil costs emphatically partner with stock costs, if oil value stuns replicate variations in total interest, however contrarily configured with stock costs, reproduce variations. In summary, stock costs cause variations in oil costs, it might be said that higher oil costs are related with lower stock costs, while lower oil costs are not related with maximum stock costs. Since Oil holds the significant product of nature that contributes to the economy, however, its vulnerability to cost brings monetary development as well as advancement. Vo (2011), for instance, opines that an increase in oil value prompts to increase costs which influence customer certainty, growth and monetary development.

The present literature hinges on a number of endeavors to acknowledge the influence of variations in oil values across the world positively on macroeconomic factors, for instance, candid growth rates in gross domestic products, exchange rates, as well as inflation amongst others (Balke, Brown, & Yucel, 2002; Davis & Haltiwanger, 2001; Gisser & Goodwin, 1986; Hamilton, 1983). All of these studies configure with one another on the whole though they reflect contrasting beliefs on the magnitude of their respective observational discoveries.

In endeavor to examine the impact of oil-value variation in assets worth, for example, stock prices or stock earnings. Marketplace members need a structure that distinguishes how oil-value variations influence stock prices or securities exchange proceeds. On theoretical level, oil-price shocks influence securities exchange revenues or prices through impact on predicted outcomes (D. W. Jones et al., 2004). Prior to this, unpredictability of fuel price was found negatively impacting stock rates (Sadorsky, 1999). C. M. Jones and Kaul (1996) found that worldwide stock values correspond to shocks in fuel charges. Huang et al. (1996) contributed that

causation has a role to play in future oil prices regarding revenue rates. R. Faff and Brailsford (2000) Assessed that risk associated with oil-value was found correlated with financial market hazard, in Australia stock exchange.

Following the major oil crisis in 1973, a book published in 1978 indicated the reliance of food supply on petroleum derivatives (Green, 1978). It was uncovered that food system is thoroughly relying on unrefined petroleum an asset that is for limited and exhausting stage.

Oil is utilized as the crude material and vitality source all through the food preparatory process from planting to packaging (Church, 2005). The varieties seeking access to oil price influences the worldwide food supply system. In 1960 the oil revelation was at the top. About 2/3rd of world oil reserves are located in the Middle East, mostly Saudi Arabia, Iraq and Iran. The world's economy is driven by an adequate stock of oil-based energy (Campbell, 1997).

The three key areas where oil is utilized are food processing, transport and heating. Oil generation and food production are concerned with the world population. As the world population grows, the interest for food increments and furthermore the oil request grows further being the primary contributor of food system. Our food supply as well as financial development both relies on the sensibly estimated oil (Church, 2005).

1.1 Theoretical Background

In contemporary finance, a great deal of consideration is given to the Stock market productivity from the perspectives of different market analysts and specialists. Unveiling markets effectiveness, the term efficiency creates a link between information and revenue charges. In this scenario, the connection of EMH indicated that there exists timely and rapid incorporation of information to the stock prices. In this way, every financial specialist gets the desired returns from the investment (Reilly & Brown, 2011). As per (B. Malkiel & Fama, 1970) findings, the allotment of assets depends on the choice of reasonable value revelation that is possible when markets are effective and provide all pertinent data. Thus, the evaluation of the

conduct of the securities exchange get its significance admitted.

A productive market is therefore, defined as the market where stock costs join all accessible data, past or present, and speak through it. This suggests costs following an irregularly adopted model in an effective market. Since the data is effectively available to everybody, there is a bad situation for anybody to gain irregular returns. A host of variables are vital to the effectiveness of a security advertise.

Dyckman and Morse (1986) expressed that, "A proficient security market is a market if (a) the price of the exchanged security completely shows the all accessible data (b) these prices respond quickly and in an un-inclination structure to new data". Then again, there is an opportunity that prices can mislead the financial specialists and will additionally impact the basic decision-making procedure of determining securities. Along these lines, the component of market inefficiency can win the marketplace and abandon the EMH (Aumeboonsuke & Dryver, 2014).

1.2 Gap Analysis

A lot of research was done on the correlation among crude oil charges as well as commodity charges seeking the impact of oil rates on stock rates in relation to stock market but fewer studies were found on the influence of crude oil prices and food sector stock prices among oil exporting and oil importing nations. Prominent commitments incorporate (Broadstock, Cao, & Zhang, 2012; Dutta & Noor, 2017; Henriques & Sadorsky, 2008; Managi & Okimoto, 2013; McSweeney & Worthington, 2008; Reboredo, 2015; Soytas & Oran, 2011) Wen et al. (2014), Bondia et al. (2016), and Reboredo et al. (2017). Food sector seeks dependence on oil that is utilized as the crude material and vital source of the food preparatory process from planting till packaging. (Church, 2005).

1.3 Problem Statement

The current research tends to explore the actuality of association found among

oil price and food sector among oil importing and exporting nations. During this investigation, the area regarding variation in mean and spillover between oil prices and food sector along with investigating the effects of oil price shock on food sector will be explored which is not studied yet.

1.4 Research Question

As per the research premise conceived, the study needs to answer the following questions:

- How does information created in oil sector transmits to the food sector across oil exporting and importing countries??
- Does correlation exist among different sectors time-varying?
- Does the correlation among different sectors indicate asymmetric behavior?

1.5 Objective Of The Study

The following objectives are set for the study to achieve:

- To explore the mean & volatility spillover from oil price to food sector across oil exporting and importing countries?
- To review the possibility of dynamic conditional correlation among both oil and food sectors across the oil exporting and importing countries?
- To review the asymmetric behavior of conditional correlation among both oil and food sectors across oil exporting and importing countries?

1.6 Significance of The Study

Oil sector has underpinned a great deal of variations in the oil prices over a span of time. Very scanty literature is available on the association midst stock market as

well as oil prices. Recent decades have witnessed the quest of researchers in seeking the association between oil prices as well as stock market. But no such study was witnessed conducted on the relationship among oil prices and food sector stock market. This study assumes significance when it shows its determination to unveil mean and volatility spillovers of crude oil on food sector in oil importing and exporting nations. It resorts to extend its landscape in the wake of investigating association of oil charges and return involved in equity market. This study has vital implications for the policy makers and investors to adopt right decisions for making investment in food sector keeping in view of the changes occurring in the field of oil prices.

Chapter 2

Literature Review

2.1 Volatility Spillover

Volatility spillover is referred as per risk spillover. Higher volatility is indicative of higher risk. Returns on financial asset also includes commodity returns that normally reveal volatility clusters over the period of time. It was observed that clusters are reflected by periods relating to high volatility, and at that time low volatility to get recognition as clusters. Return fluctuations occurs in one market echoed in the other market indicated through fluctuations in the returns, this leads to occurrence of volatility spillover. In plain terms, the spillover effect emerges in form of ripple effect developed by an event in one country on another country' economy, generally a dependent country. However, some states feel a cushion as a result of the spillover effect being taken as safe haven economies thereby investors prefer to park assets to face off downturns (C. M. Jones & Kaul, 1996).

To undertake testing of volatility spill over among the three price indexes utilized for the study, the Granger causality was utilized through application of variance approach conceived by Cheung and Ng (1996). Adopting the procedure the mean equations about the three series were examined. The concerned series need to be stationary, hence the natural logs with 1st differences are deployed in the mean equations, in the light of formulation of the unit root tests. In connection with returns pertaining to the food and oil returns, an information criteria framed by

Akaike was provided basis to select a mean equation having a single constant; while, relating to the agricultural raw material, returns ARMA(2, 2) were selected. ARCH effects require for explicit modeling. Henceforth, the univariate GARCH models were constructed. In relation to agri raw material as well as food returns GARCH (1,1), relating to oil returns EGARCH(1,1) model were found appropriate. The remaining sample cross-correlation functioning among the squares of the two standardized remaining lead to derive and compute the test statistic that denotes asymptotical follower of the standard distribution. The adoption of CN practice empowers to realize the time lag involved in the occurrence of the volatility spillover (Cheung and Ng, 1996).

Until this point, little is thought about the volatility spillover effects among oil and financial exchanges. Agren (2006) utilizes a asymmetric version of the BEKK–GARCH(1,1) model to contemplate the instability transmission from oil costs to securities exchanges in five significant created nations (Japan, Norway, Sweden, the U.K., and the U.S.). The creator shows solid proof of instability spillover from oil to every financial exchange examined, aside from Sweden. In any case, the news sway surfaces, which represent the assessed one-time frame ahead figure effect of an oil shock, uncover just little impacts. Utilizing a similar model, Malik and Hammoudeh (2007) take a gander at the instability transmission among the US value showcases, the worldwide raw petroleum market, and three Gulf value markets including Bahrain, Kuwait, and Saudi Arabia. They show that Gulf value markets get instability from the oil market, however financial exchange instability just spillovers into the oil market in the instance of Saudi Arabia. In their ongoing commitment, Malik and Ewing (2009) look at the instability transmission between oil costs and five US part records by embracing bivariate BEKK–GARCH(1,1) models. The parts considered incorporate Financials, Industrials, Consumer Services, Medical services, and Technology, and the exact outcomes uphold the presence of critical transmission of shocks and volatility between oil costs and diverse financial exchange areas. At long last, Chang et al. (2009) utilize different multivariate GARCH(1,1)models to examine volatility

spillovers between WTI (West Texas Intermediate) unrefined petroleum fates returns and stock returns of ten worldwide oil organizations. Shockingly, the exact discoveries show no volatility spillover impacts in any sets of bring arrangement back.

The investigation of Ewing et al. (2002), though not straightforwardly identified with our own, offers as far as concerns its few fascinating bits of knowledge about the volatility transmission between the oil and natural gas markets. All the more exactly, their outcomes show critical immediate and roundabout transmission of instability from the gaseous petrol market to the oil market, however just powerless proof of volatility spillover the opposite way. As indicated by the creators, these discoveries can be regularly clarified by contrasts in the instability conduct of the oil and petroleum gas markets. Generally, contrasted with the past writing, our examination expands on the ongoing VAR–GARCH model, and moves from the market-level investigation to a part level examination by taking the stock market divisions in Europe as a contextual investigation. It additionally offers experiences into the possible increases of cross-market supporting just as the sharing of regular data by market administrators.

Both oil costs and financial exchange costs are inherently connected with the economy. There is hearty proof in the writing recording a solid connection between oil costs and the economy (Hamilton, 2003). Additionally, since stock costs are the present limited estimation of future net income which are subject to the economy, one ought to hope to locate a critical connection between changes in the costs of oil and the securities exchange (Jones and Kaul, 1996). It is in this way normal to anticipate the costs as well as volatilities of these two arrangement to be connected in resource valuing models. Ross (1989) shows that instability in resource returns relies on the pace of data stream, proposing that the progression of data from one market can be consolidated into the volatility creating cycle of another related market. In any case, these elements may change after some time because of auxiliary changes in the fundamental economy or basics that drive these two business sectors.

A developing assemblage of exploration has risen on the connection between oil

costs and financial exchange costs. Jones and Kaul (1996) show that the response of the US financial exchange to oil shocks can be totally represented by the effect of these shocks on genuine incomes. Utilizing a vector auto relapse (VAR) system, Sadorsky (1999) has indicated that both oil costs and a uni variate GARCH proportion of oil value volatility assume critical parts in influencing financial exchange returns. Basher and Sadorsky (2006) report the effect of oil value changes on developing financial exchanges. In an ongoing report, Driesprong, Jacobsen and Maat (2008) show monetarily and measurably noteworthy consistency of stock returns when consolidating oil value changes in their model utilizing information from both created and developing business sectors.

The present study little is thought about the volatility spillover effects among oil and financial exchanges. Agren (2006) utilizes a asymmetric version of the BEKK–GARCH(1,1) model to contemplate the instability transmission from oil costs to securities exchanges in five significant created nations (Japan, Norway, Sweden, the U.K., and the U.S.). The creator shows solid proof of instability spillover from oil to every financial exchange examined, aside from Sweden. In any case, the news sway surfaces, which represent the assessed one-time frame ahead figure effect of an oil shock, uncover just little impacts. Utilizing a similar model, Malik and Hammoudeh (2007) take a gander at the instability transmission among the US value showcases, the worldwide raw petroleum market, and three Gulf value markets including Bahrain, Kuwait, and Saudi Arabia. They show that Gulf value markets get instability from the oil market, however financial exchange instability just spillovers into the oil market in the instance of Saudi Arabia. In their ongoing commitment, Malik and Ewing (2009) look at the instability transmission between oil costs and five US part records by embracing bivariate BEKK–GARCH(1,1) models. The parts considered incorporate Financials, Industrials, Consumer Services, Medical services, and Technology, and the exact outcomes uphold the presence of critical transmission of shocks and volatility between oil costs and diverse financial exchange areas. At long last, Chang et al. (2009) utilize different multivariate GARCH(1,1)models to examine volatility

spillovers between WTI (West Texas Intermediate) unrefined petroleum fates returns and stock returns of ten worldwide oil organizations. Shockingly, the exact discoveries show no volatility spillover impacts in any sets of bring arrangement back.

The investigation of Ewing et al. (2002), though not straightforwardly identified with our own, offers as far as concerns its few fascinating bits of knowledge about the volatility transmission between the oil and natural gas markets. All the more exactly, their outcomes show critical immediate and roundabout transmission of instability from the gaseous petrol market to the oil market, however just powerless proof of volatility spillover the opposite way. As indicated by the creators, these discoveries can be regularly clarified by contrasts in the instability conduct of the oil and petroleum gas markets. Generally, contrasted with the past writing, our examination expands on the ongoing VAR–GARCH model, and moves from the market-level investigation to a part level examination by taking the stock market divisions in Europe as a contextual investigation. It additionally offers experiences into the possible increases of cross-market supporting just as the sharing of regular data by market administrators.

2.2 Efficient Market Hypothesis (EMH)

The theory based on efficient market hypothesis (EMH) takes the stance that share prices is capable to reproduce all information. The EMH theorizes that stocks trading at the fair market value prevalent on exchanges. Followers of EMH postulate that investors seek financial advantage by making investment in cost effective and reflexive portfolio. The 'efficient market hypothesis' assumes that with the influx of novel information in the market, it immediately gives reflection on stock prices thus excess returns is hard to generate either through any technical or fundamental analysis. This adds to validity of the efficient market hypothesis. This hypothesis carries three key versions such as "weak," "semi-strong," and "strong". According to the weak-form, prices encaged on traded assets like bonds, stocks, and property provide the reflection of historical information available. For

instance, that is why you sometimes face difficulty in seeking car parking that is (i) free, (ii) near the work, and (iii) the place you park whole the day. Despite the EMH has proved wrong yet proponents of The EMH claim that it is not possible to overcome the market in a consistent manner since all information available in form of price but the gain acquired so in the market will prove transient. Based on this reasoning, it would be difficult to overcome the market in the long-run.

2.3 Oil Prices Shocks and Stock Index

Collapse in value of raw petroleum and its effect on the world economy has been a point of concern for market analysts (Barsky & Kilian, 2004; Hamilton, 1983; Kilian & Park, 2009). Plenty of research has examined the effects of fuel value shocks on the financial and economical values of oil exporting countries comparing with oil importing countries (K&P, 2009). As an instance, though the affiliation of oil price with high economic condition was consistently detailed as negative, escalations in oil costs might reflect beneficial outcomes on the general savings of oil exporting nations.

Even though high oil costs may ignite growth in industry expenses as well as inflation charges, just as reduction in use of non-oil produce with oil importing nations, these may have to pay more for oil exporting nations on the basis of the low value flexibility associated with raw petroleum demand (Bjørnland, 2009; Jung & Park, 2011). Many research has unveiled blended link-up between oil value stuns and the profits on stock lists. Furthermore, Perry Sadorsky, 1999 examined that fuel value developments are key to clarify developments in major stock returns in comparable markets. However, Perry Sadorsky, 1999 uncovered that oil value developments tend to clarify a larger alteration in genuine stock revenues as compared to costs inflicted by loan. The study found a crooked and equally shock communication transmitting from fuel price movements to contribute to revenues on the U.S. stock file. In quest to extend the investigation, (C. M. Jones & Kaul, 1996) explored that variant oil outcome adversely affects yield as well as genuine stock earnings in the countries like U.S, Japan, Canada, and U.K.

Though the field of oil markets is well researched area of investigation yet there exists an fascinating enthusiasm to demonstrate the value instability and breaking down the unpredictability transmission component that predominantly prevails in money related markets. A few studies have unequivocally scrutinized the communication of mean and instability across oil and money related marketplaces, for example examined the unpredictability and stun communication among US value advertise, global marketplace of unrefined petroleum, and value marketplaces of main affluent Gulf nations (Saudi Arabia, Kuwait, & Bahrain).

(Arouri & Nguyen, 2010) examined the link between changes in fuel value and stock revenues at the breakdown position in Europe by exploring their transient linkages throughout the last fierce decade utilizing diverse econometric strategies-Singh et al. (2010) studied the transient instability overflows among created and developing securities exchanges utilizing VAR-GARCH models, (Zhang & Wei, 2010) attempted to probe the relationship between the raw petroleum and gold markets from January 2000 to March 2008, (Arouri & Nguyen, 2010) investigated the incoming linkage and instability communication among oil and financial exchanges in the Gulf Cooperation Chamber (GCC) nations-Filis et al. (2011) contemplated the time-differing relationship among the financial institutions costs and oil costs for oil-carrying in and oil-transport out countries dependent on a DCC-GARCH-GJR method, Vo (2011) modeled the unpredictability of stock and fuel fate marketplace utilizing the multivariate stochastic instability assembly.

Du et al. (2011) picked up the elements that affected the unpredictability of raw petroleum costs and linking among this instability and horticultural product selling platforms, Kumar et al. (2012) contended that the variety in the lists of renewed vitality stocks is clarified by past developments in oil costs, the stock costs of greater innovation firms and loan costs. Sadorsky, (2012) displayed the unpredictability elements among oil and the stock costs of refresh vitality and innovation organizations utilizing the energetic restrictive relationship MGARCH models and (Awartani & Maghyereh, 2013) examined return and unpredictability overflow impacts among oil and values in the GCC nations while the period of 2004 to 2012.

Boyer and Filion (2007) Identified the variables that illuminate the stock outcomes of Canadian oil and gas organization. It was specifically, investigated whether stock returns of Canadian oil and gas organizations are dedicated to five showcases along with five potential components. The market-based variables incorporate market return, loan fees, the swapping scale, oil costs and gaseous petrol costs. The five essential factors are variances in demonstrated stores, capacity of generation, operative incomes, and above all, milestone achieved. Generally, it was found that the stock returns of Canadian oil and gas organization are related to the market return, valuation for unrefined petroleum and flammable gas costs, development in inner money streams and demonstrated stores. In other words, it was traced that an expansion in loan costs, generation capacity and devaluation of Canadian $againstUS$ grant negatively impacts stock returns.

Driesprong, Jacobsen, and Maat (2008) found that an ascent in fuel costs brings down upcoming stock revenues significantly on month to month basis and slacked month to month oil value changes reinforces further if extra slacked estimations of the oil value variations are utilized.

McSweeney and Worthington (2008) Studied the effect of fuel costs alongside other higher financial factors on the Australian firms' month to month stock outcomes utilizing information covering January 1980 to August 2006. It was further quadrated that an expansion in oil costs negatively affects stock earnings of the funding institutional retail, and transmission segments; a constructive outcome on vitality segment, and no impact on expanded money and supplies. Kilian and Park (2009) Found that oil stuns represent about 22Huang et al. (1996) applied the direction automobile relapse by VAR approach to look over the relationship between U.S. typical revenues and oil-prospects returns on day to day basis. An evidence was found that fuel-fates returns decisively serve to support an oil organization and oil firms stock revenues, however did not found to affect other industry lists or the total S&P 500 list.

Examining the effects on the Australian business value reflects spiral effects attributed to changes in fuel value. The research recommended that oil is a significant determinant in the firm-based return producing procedure in Australia

and that the bearing and size of oil stun effects industry-wise (R. W. Faff and Brailsford, 1999). Prior to this, economic theory recommended that any comparative cost ought to be controlled by its regular incomes (Fisher, 1930); Williams 1938). In this connection, any aspect that would change the normal limited incomes ought to significantly affect these comparative costs. Subsequently, any oil cost increment would result to expanded costs, limiting benefits and more prominent expansion would cause decline in investors' worth. Therefore, any oil cost increment must be combined by a diminishing stock charges. However, question remains valid whether impact on oil importing and exporting nations would be equivalent?

Numerous generators contended that oil value impact on financial exchanges gives an indirect impact reflected through the macroeconomic indicators. As per study of (Bjørnland, 2009; Jiménez- Rodríguez* & Sánchez, 2005), an oil cost increment reflects a beneficial outcome for a fuel trading nation, as the nation' revenue will increment. Subsequent of the rise in the revenue increment results in ascent in consumption and projects, which eventually causes more productivity and low unemployment. Financial exchanges generally react vigorously to such happenings. For the oil importing nations, oil prices increment sometimes brings the contrary outcomes in general; (see LeBlanc & Chinn, 2004). Oil cost increment swiftly rises expense of generation, as fuel is one of the greatest generative determinant (Arouri & Nguyen, 2010; Backus & Crucini, 2000; I.-M. Kim & Loungani, 1992). The development cost will move on to the customs side, thus works to bring down interest all the most, along these lines more buyer spending, because of higher customer costs; see for instance, (Abel & Bernanke, 2001; Bernanke, 2006; Hamilton, 1996). Less utilization can prompt lower production that results in high unemployment; (seeBrown & Yücel, 2002; Davis & Haltiwanger, 2001; Lardic & Mignon, 2006). Securities exchanges could respond adversely in such situation; (see Perry Sadorsky, 1999).

Hong et al. (2002) similarly found distinguishing negative relationship among oil-value returns and financial exchange returns. (Driesprong et al. (2008); Pollet (2005)) found that oil-value variations anticipate financial exchange revenues on a

worldwide premise(Hammoudeh & Li, 2004) additionally found the significance of the oil determinants at stock prices in oil exporting economical countries. Chittedi (2012) examined the association among oil charges and stock returns on account of Pakistan, also, the outcomes uncovered that increments in fuel prices prompted increment in inflation subsequently, the State Bank expands the interest rates. Hence, as an outcome of the greater interest rates, the financial experts predict to bring down the stock returns.

El-Sharif, Brown, Burton, Nixon, and Russell (2005), concluded a field-founded examination, proved the association among fuel prices and inventory revenues, recorded on the London Stock Exchange. According to the exact findings, a huge positive relationship among fuel prices and oil-associated stock returns is found. In any case, the quality of such an affiliation shifts widely over divisions, mirroring the requirement for macroeconomic and political components additionally considered vital in the investigation, a contention correspondingly supported by (R. W. Faff & Brailsford, 1999).

However, the statistic of varieties in oil prices increases vulnerability in economic development of a nation for explaining the oil impact significantly affect generative factors, since expansion in price prompts inflation with rise in high unit price because of high production prices yet with a specific goal in mind conjecture of increment prices further expands production to fulfill consumer needs. Dutta & Noor, (2017) showed that increments in oil prices impacts pretty much on every segment of our day to day items because of its effect on securities exchange of that nation. Stock return influences in two different ways: the normal income expected cash flow and discount rate used to equity value gets influenced because of rise in oil prices. Ciner et al. (2013) Clear through exploration that huge nonlinear linkage varies between stock returns and fuel prices.

Volatility spillover appears when price instability in one market passes on to other market and causes price instability. Future stock market returns are potentially affected by any economic activity such as oil prices volatility. Direct or indirect operational price of oil affects earnings of companies and also real GNP gets effected from oil value fluctuation. If the stock market proficiently exploits the oil

value increase, it immediately suggests decrease in stock prices and so decrease in expected earnings but if the stock market behaves inefficiently, there may be lag in settlement to the oil prices. An investigation executed by C. M. Jones & Kaul, (1996) in US found that fluctuation in oil prices certainly affect the stock revenues.

In preliminary investigation conducted on the influence of fuel rates on stock rates, a significant influence was identified in oil prices on cumulative real stock returns, counting a lagged influence, during the period 1947-1991. The work was recognized at the macroeconomic level where the magazine data and manufacturer Price Index was applied instead of oil price index. Perry Sadorsky, (1999) By using unrestricted vector auto regression model, the association among oil price instability, stock market returns and the economic paradigm drive was examined.

At the demand and supply level, the oil price influences the macro level economy (Cunado & Perez, 2005). Researched on some Asian states revealed that rise in oil prices can cause inflation since it transfers wealth from oil importing to the oil exporting nations and upsurge in oil prices increases this ratio (Sachs et al., 1981). The rise in oil prices influences various industries in different ways various investigations have held the unstable oil rates responsible to impact macro economy, inflation, agricultural commodities, employment, firm returns, as well as exchange rate. As per conclusion, oil price does influence the stock return in asymmetric and symmetric way depending upon the economy and other macro-economic variables.

The investigation by Jones and Kaul (1996) was the main commitment to inspect the response of securities exchanges to oil shocks. The creators consider four created markets (Canada, Japan, UK and US) and draw experimental outcomes from a standard present worth model. They find that adjustments in stock costs can be halfway represented by the impact of oil value developments on the current and future incomes. Along these lines, Apergis and Miller (2009), Fayyad and Daly (2011), Huang et al. (1996), Park and Ratti (2008), and Sadorsky (1999), among others, likewise give proof of critical reactions of stock returns to oil shocks from utilizing different methodologies, for example, vector autoregressive (VAR) model,

global multifactor assets pricing models, cointegration, and vector error correction model (VECM). As to developing business sectors, oil shocks cause huge changes in stock returns over both the short-run and since quite a while ago run (Basher and Sadorsky, 2006; Narayan and Narayan, 2010; and Papapetrou, 2001).

A few investigations have inspected whether oil value changes influence area stock returns. These examinations are likewise generally nation explicit, furthermore, thus don't allow to finish up on a territorial and additionally worldwide point of view. For instance, the papers of Boyer and Filion (2007) and Sadorsky (2001) show that oil cost increments emphatically influence the stock returns of Canadian Oil and Gas organizations. El-Sharif et al. (2005) arrive at a similar resolution for Oil and Gas returns in the UK. Non-Oil and Gas segments are, in any case, pitifully connected to oil cost changes. Nandha and Faff (2008) question the short-run connect between oil costs and 35 Data stream worldwide businesses and show that the ascent in oil cost has a negative effect for all businesses aside from Oil and Gas. Nandha and Brooks (2009) are worried by the response of the vehicle segment to oil costs in 38 nations around the world. Their outcomes show the various functions of oil with respect to the assurance of the vehicle segment returns for created nations, be that as it may, show no such proof in Asian and Latin American nations

More recently, Arouri and Nguyen (2010) utilize diverse econometric strategies to look at momentary connections among oil and stock costs in the total just as area by division levels in Europe. Their discoveries uncover two fascinating realities: I) the responses of stock comes back to oil cost changes contrast extraordinarily relying upon the movement part; ii) the out-of test examination shows that including oil resource into a broadened portfolio of stocks permits to essentially improve its danger bring qualities back.

In spite of the fact that the association between oil costs and securities exchange costs in level structure is very much reported, the ongoing focal point of studies is to inspect their connections at the instability level. This is fundamentally in light of the fact that instability in the costs of oil and the securities exchange is a significant contribution to present day full scale econometric models, monetary

market hazard appraisal estimations, and resource evaluating formulas. Sadorsky (2003) shows that the restrictive volatility in oil costs, among different factors, significantly affects the contingent instability of innovation stock costs.

The majority of studies analyzing the oil-stock market volatility relationship are performed at the total level. Malik and Hammoudeh (2007) and Awartani and Maghyereh (2013), among others, inspect the instability transmission instruments among the US value market, the worldwide raw petroleum market and the value markets of the major oil rich Inlet nations, demonstrating critical communications among them. Later considers zeroing in on the US market report critical spillover impacts between the oil and financial exchanges (Ewing and Malik, 2016; Phan et al., 2016). Different investigations think about various worldwide financial exchanges. Khalfaoui et al. (2015), for example, analyze instability spillovers impacts in oil and securities exchange costs utilizing day by day information from the G7 securities exchanges. Maghyereh et al. (2016) research the connectedness between oil and 11 significant securities exchanges utilizing suggested volatilities. Their outcomes show that the affiliation is overwhelmed by transmissions from the oil market to the equity markets, not the other way around. All the more as of late, Wang and Wu (2018) look at uneven volatility spillovers between oil and worldwide financial exchanges, and give proof that terrible complete volatility spillovers command the framework and change over time; this recommends markets are ruled by a critical state of mind furthermore, clueless dealers who will in general increment volatility. While such considers recognize a nearby connectedness among oil and securities exchanges at the total level, they may overlook the heterogeneity watched while applying division level methodologies. Practically speaking, all things considered, portfolio chiefs and speculators would be keener on area level speculation suggestions than in total examinations.

Given that total securities exchange lists may cover the heterogeneity of various areas' reactions to oil value vulnerability, a few creators have adopted segment level strategies. Unrefined petroleum and sectorial stock markets are connected through a few channels. Malik and Ewing (2009) give proof of huge volatility

transmission among oil and five US sectorial stock markets (i.e., financials, industrial, customer administrations, medical services and innovation). The critical connections revealed among oil and sectorial securities exchanges highlight the nearness of cross-market supporting and the sharing of regular data by financial specialists. Arouri et al. (2011) additionally investigate the degree of volatility transmission among oil and securities exchanges in Europe and the US at the division level. They show that oil value instability may influence a few divisions more seriously than others, depending on whether oil and oil-related items are an info or a yield for the businesses, and on the backhanded impact of oil costs on the ventures. Further investigations by Arouri et al. (2012) and Haddow et al. (2013) show that oil shocks impact financial conditions (creation costs, monetary development and market certainty) to shifting degrees relying upon the part, which is the reason area costs have heterogeneous responses to oil value vulnerability. All the more as of late, Bouri et al. (2016) and Tiwari et al. (2018) investigate the instability communications among oil and sectorial stock markets and find that these cooperation's rely upon the beginning of oil shocks, (for example, demand, supply and precautionary demand shocks).

While these investigations offer experiences into the reasons (or channels) behind the connections between unrefined petroleum and sectorial financial exchanges, they state nearly nothing about the recurrence elements of instability spillovers among those markets. A shock with a drawn out impact will have high force at low frequencies, causing a drawn out spillover when the shock is sent to different factors. On the other hand, a shock may cause a deviation from the drawn out pattern (impact) through a transient spillover when being sent to different factors. On account of securities exchanges, perpetual changes in assumptions regarding future profits have a since quite a while ago run impact (Balke and Wohar, 2002; Ortu et al., 2013). Interestingly, a transitory alteration of money related strategy will influence the market in the short run. Thus, these shocks will be communicated through the business sectors with diverse recurrence reactions.

Notwithstanding, the capacity to gauge spillovers by utilizing the above sorts of models is limited; more specifically, merely measuring the return and instability

spillover through the noteworthiness of boundaries by assessment under an uncommon difference structure can't gauge the degree of spillovers or on the other hand catch the heading of spillovers (Zhou et al., 2012; Kang et al., 2017; Wang and Guo, 2018).

Despite the fact that the nearness of uneven instability in money related business sectors has for some time been perceived in the writing, shockingly, past examinations of asymmetries in instability spillovers have not yet gotten a similar consideration. With the accessibility of high-recurrence information, research on monetary market volatility has taken new roads. Andersen and Bollerslev (1998) proposed a hearty measure for actual market volatility, called the figured it out instability (RV). Barndorff-Nielsen et al. (2010) proposed figured it out semi fluctuation (RS) that disintegrates RV into great and terrible volatility due to positive or negative returns. Baruník et al. (2016) were the first to propose instructions to evaluate asymmetries in instability spillovers that rise due to terrible and great volatility, and they found that abundant proof of the unbalanced connectedness of stocks at the disaggregate level and the spillovers of terrible and great instability are sent at various extents that change generously after some time in various segments. Besides, Baruník et al. (2017) reexamined directional asymmetries in instability spillovers, consequently making their understanding clear.

There is some writing analyzing the connection between oil cost and the Chinese financial exchange (Wen et al., 2012; Zhou et al., 2012; Broadstock et al., 2012; Zhang and Wang, 2014; Broadstock and Filis, 2014). Broadstock et al. (2012) utilized the BEKK strategy to examine the connection between worldwide oil costs and vitality related stocks in China, they found that worldwide oil value changes are connected with vitality related stock returns with regards to China, yet in a period subordinate way; the outcomes show an a lot more grounded relationship following the 2008 budgetary emergency. Wen et al. (2012) utilized time-changing copulas and the GJR model to examine the infection impact between raw petroleum and US/Chinese securities exchanges, and they found that the reliance between raw petroleum and securities exchanges essentially increments after the disappointment of Lehman Brothers. Zhang and Wang (2014) analyzed

the return and volatility spillovers among China and world oil markets, expanding Diebold and Yilmaz's (2012) technique for getting spillover elements, and they found that the return and volatility spillover among China and world oil markets are bi-directional and uneven; the Chinese oil market is profoundly influenced by world oil markets what's more, applies an impact on world oil markets, despite the fact that less significantly. Notwithstanding, in spite of the fact that the US/Chinese securities exchanges are the first and second-biggest securities exchanges on the planet, scarcely any investigations have inspected the lopsided volatility spillover among oil and the US/Chinese financial exchange.

As oil is the basic input of food sector companies, it can be anticipated that the fluctuations in the price of crude oil will affect stock of food sector companies. This research aims to assess this relationship between price of crude oil and stock of food sector companies with further assessing whether this spillover is greater in oil importing or exporting countries. The spillover among crude oil and the stock of food sector companies is the area least or not studied by any researcher. Therefore, the study is going to explore the volatility spillover effect of crude oil on food sector companies of oil importing and exporting states.

2.4 Oil Importing and Exporting Countries

Numerous studies were conducted on finding relationship among variation in oil rate and stock market outcomes. Many investigations showed their concern on the role of stock exchanges in oil-importing economies, particularly the US market. Different studies move their enthusiasm for the oil value shock origin, for example call sideways or source line side shocks (Barsky & Kilian, 2004; Hamilton, 1983; Lescaroux & Mignon, 2008).

Many had the agreement on having negative correlation between oil values and securities exchange exercises (Syed Abul Basher, Haug, & Sadorsky, 2012; Elder & Serletis, 2010; C. M. Jones & Kaul, 1996; Kilian & Park, 2009; Perry Sadorsky, 1999), although a number of researches explored that the effect of oil value changes on financial exchanges is not viewed as noteworthy as one overall grasps (Apergis

& Miller, 2009; Huang et al., 1996; Miller & Ratti, 2009).

Commencing with an oil value shock emerges as a significant section while looking for the relationship between the oil prices and stock exchanges. Exactly,(Lescaroux & Mignon, 2008) recommended that supply-side shock could be recognized with maximum oil value unpredictability, in meanness of the statistic that it may not be the major explanation. Demand side shocks likewise legitimize high oil value volatility. Hamilton (2009b) contended that demand side shock find link with nations development, for instance, China could have a big power. It was additionally articulated the assessment that absence of quick reaction of oil-supply to a huge scale growth in oil-demand can outcome to a demand side shock.

Kilian and Park (2009) upheld that claim side oil value leaves more shocks impact on stock prices than the supply side value oil shocks. Demand side oil value shocks practice a negative effect on stock prices because of the preparatory interest for raw petroleum, which echoes the vulnerability of upcoming oil supply accessibility. Be that as it may, it was proposed that if the demand side oil value shock is driven by worldwide monetary development, at that point higher oil prices will source a positive impact on stock prices, which is in accordance with Hamilton's (2009b) opinions.

Regarding the oil-exporting nations, (Al Janabi, Hatemi-J, & Irandoust, 2010) utilized bootstrap test for causation fitting for non-ordinary monetary information with time-shifting instability and inferred that GCC financial exchanges are educationally proficient with respect to oil quantities, for instance oil charges in general, don't affect the securities exchanges and in this manner oil prices can't be utilized as indicators for the GCC securities exchanges. Explicitly for oil-importing nations, (Al-Fayoumi, 2009) found no proof that oil value shocks influence the financial exchanges. In any case, most investigations in the literature focused the budget of the US, the biggest oil trader, comparing with a number of fuel-exporting nations. A potential anxiety is that the effect of oil value shudders on the nationwide trading of oil-exporting nations cannot be quite the same as that of oil-importing countries.

For example, while the association among oil price and macroeconomic maneuvers

has been consistently detailed as negative, increments in oil charges may provoke constructive outcomes on the countrywide financial situation of oil-exporting nations.

While raising the oil prices may originate increments in firms prices and inflation ratio, just as a decrease of use on non-fuel products (Barsky & Kilian, 2004) in oil-importing nations, they must create extra profit for oil-exporting nations because of the low value flexibility of raw petroleum request (Bjørnland, 2009); Jung and Park, 2011). Given this heterogeneity, the reaction of securities exchange comes back to oil value shocks in oil-exporting nations can be controlled by the comparative necessity of positive and negative effects on these nations.

Then again, many past research investigations have ignored examining the association among oil prices and financial exchanges in oil-exporting nations. Bjørnland (2009) Expressed that a 10Focusing the significance of reaction with fuel supply and demand reflected by financial exchanges of the oil-trading nations (Norway) and an fuel-importing nation (Korea) (Jung and Park, 2011). The research lead to explore that the reaction of financial exchange comes back in form of oil value shocks in these two nations that shows enormous variation towards each other. By and large, the outcomes in these three investigations demonstrate that the effects of oil value shocks on financial exchanges in oil-exporting and importing nations are mixed with each other.

In contrary to the past declaration related to a solitary oil-exporting nation (Norway) or on producing nations, a few nations that generate and export unrefined petroleum than Norway (e.g., Saudi Arabia and Russia), and developing economies, for instance, China and India may have the capacity to increment the oil price (e.g., Hamilton, 2009; Kilian, 2009). Therefore, it is imperative to explore the effects of oil value shocks on securities exchanges in other oil-exporting economical defender nations and in creating oil-importing financial institution. The general significance of oil to various financial platforms is mixed. An inquiry propelled from the current investigations is whether the distinctions of the effects on financial exchanges are broadly occurred among oil-exporting and oil-importing economical countries.

By utilizing the bivariate BEKK-GARCH model, Hammaa et al. (2014) affirmed that fuel resources assume a notable job in regulating the probability of stock collection. Resulting a comparable flow of exploration, Lin and Appiah (2014) contemplated the overflow among the oil advertise and the stock showcase. For this reason, selection of Ghanaian and Nigerian stock showcases was made detailing the closeness of stun communication as well as instability overflow between the oil showcase and the financial exchange. It was further affirmed on the same lines that oil resource serves as a supreme fence against the threat of stock resources.

Khalfaoui et al., (2019) examined the association of oil showcase with the financial exchange by utilizing BEKK-GARCH econometric method to conduct analysis of the overflow between the fuel showcase as well as the securities exchange. Their research followed the notable advancement made by (Kroner & Ng, 1998) and Sultan (1993), discretely. The outcomes was based on the examining the overflow amongst the oil advertise as well as the financial exchanges pertaining to G-7 states. Their outcomes was based on the premise that oil resources prove valuable in providing support to the stock collection hazard.

Hammoudeh and Li (2004) selected to apply univariate as well as multivariate GARCH to conduct an analysis of uncertainty, and volatility found in the raw petroleum marketplace and its impact on the value return instability of the S&P oil area lists. It was found that oil instability variations have a categorical impact on the supplies of the organizations.

A few investigations have researched the nexus of the oil-importing and oil-exporting economics. Out of these, (Mohammadi & Su, 2010) investigated the elements of oil value mean and unpredictability by utilizing four classes of restrictive unpredictability models with symmetric and deviated particulars, specifically, GARCH, EGARCH, APARCH and FIGARCH pertaining to the span covering January 1997 to October 2009 based on weekly information targeting eleven raw petroleum spot costs in oil-exporting and oil-importing nations like OPEC vs non- OPEC.

The primary findings of (Mohammadi & Su, 2010) uncovered that the contingent instability of oil returns displayed time varying conduct, and the contingent

change left blended impacts. Filis et al. (2011) inspected the time-changing relationships between financial exchange costs and oil costs (Brent) for three oil-importing nations (USA, Germany and the Netherlands) and three oil exporting nations (Canada, Mexico and Brazil) selected from among the top 20 oil-importing and oil-exporting nations. Filis et al. (2011) executed an uneven DCC-GARCH system in their research investigation, and uncovered a more grounded negative linkage for oil-securities exchange matches in non-monetary emergencies and a more grounded positive among for oil-securities exchange matches in financial blast periods.

Based on both the standard GARCH and the Asymmetric Power GARCH models, Hammoudeh et al. (2010) delved into the effects of variations in global stock revenues, oil costs, degree of government support, and other allied factors, for instance, Price/Book proportion and exchanging capacity on the stock return instabilities belonged to 27 areas in the US. The standard GARCH magnitudes enable to propose that increments in oil costs for the higher side effects to reduce the confronting instability relating to the oil and oil-related parts.

Comparing the Asymmetric Power GARCH system, the effect of the informative variable is isolated into upward and descending systems. On account of the upward system, their discoveries show that increments in oil costs reduce the probable instability of a large portion of the segments counting the oil-delivering and oil-expending divisions. An abatement in oil cost in the descending system brings down the chances of instability relating to all segments, despite the fact that the impact isn't as solid as on account of the upward system.

The foregoing analysis of the literature makes it evident that vast research is present on the relationship of oil values with stock prices and also among oil importing and oil exporting countries but no research was observed yet on the volatility spillover of fuel values on food industry stock prices of oil importing and oil exporting countries. This study is determined to fill this research gap and it will be analyzed that whether spillover effect is different in dependency as reflected by oil importing and oil exporting nations. The current investigation is going to be obliging to investors, practioners and policy makers to utilize the findings for

the purposes of investment, practicing and policy making.

2.5 Models Used in Previous Research's

Utilizing a multivariate GARCH model, Malik and Hammoudeh (2007) find critical transmission of instability and shocks among US value, Gulf value and worldwide raw petroleum markets. Malik and Ewing (2009) give proof of noteworthy transmission of shocks and instability between oil costs and US value part returns. Arouri, Jouini, and Nguyen (2011) take an ongoing summed up VAR-GARCH way to deal with look at the degree of instability transmission between oil costs and financial exchanges in Europe and the United States at the area level with relating suggestions for portfolio the board.

Notwithstanding, in many examinations in the current writing, there is an overall presumption that the unlimited change of the hidden arrangement is consistent suggesting that volatility is produced by a stable GARCH measure. Be that as it may, advertises frequently experience auxiliary breaks in the genuine difference which causes breaks in the GARCH boundaries. There is ongoing proof that there are basic breaks in change in oil costs (Ewing and Malik, 2010) and stock returns (Starica and Granger, 2005; Perron and Qu, 2010). These basic breaks in instability could be brought about by political, social, financial or common occasions. In an ongoing paper, Mensi, Hammoudeh also, Yoon (2014) identify basic breaks in the unrefined petroleum market and feature the suggestions this has for strategy creators and budgetary market members (Arouri et al. (2012). Lamoureux and Lastrapes (1990) show that volatility constancy is overestimated when standard GARCH models are applied to an arrangement with basic breaks in change. Mikosch what's more, Starica (2004) give a detailed hypothetical clarification upheld with proof from reenactments and financial exchange information that overlooking auxiliary breaks in change brings about higher volatility determination inside a GARCH model.

Starica and Granger (2005) utilizing day by day stock market returns discovered more often than not arrangement elements to be packed in movements of the

unrestricted change. They report that conjectures dependent on their non-fixed unqualified model were better than those gave by the fixed GARCH model. As of late, Rapach and Strauss (2008) show that estimates produced from models that fuse basic breaks, identified with adjusted ICSS calculation, improve the conjectures on account of conversion standard instability. Subsequently, there is strong proof to recommend that an appropriately determined GARCH model should represent auxiliary breaks, if such breaks exist

An enormous number of studies have just dissected the nexus between oil costs and stock value returns (Broadstock and Filis (2014) and Degiannakis et al. (2013) and references therein) while truth be told, as of late have creators zeroed in on the instability interrelationships among oil and securities exchange returns, for the most part as far as instability spillovers (Malik and Hammoudeh, 2007; Arouri et al., 2012; Sadorsky, 2012; Awartani and Maghyereh, 2013; Chang et al., 2013; Khalfaoui et al., 2015; Ewing furthermore, Malik, 2016; Wang and Wu, 2018).

To show volatility interrelationships, the ongoing writing on oil and stock returns has utilized a number of methodological methodologies, for example, the DCC model of Engle (2002), the BEKK-GARCH model of Engle and Kroner (1995), the multivariate vector autoregressive-generalized autoregressive conditional heteroskedasticity (VAR-GARCH) model proposed by Ling and Mcaleer (2003), and the exponential summed up autoregressive conditional heteroskedasticity (EGARCH) model, alongside an instability spillover measure dependent on estimate mistake difference deteriorations from vector auto regressions, created by Diebold and Yilmaz (2012) and Diebold furthermore, Yilmaz (2014).

The global oil market has encountered a sharp ascent and fall in the course of recent years, demonstrating amazingly exorbitant cost changes. Raw petroleum impacts the economy as well as money related markets (Hamilton, 1983, 2003; Chen et al., 1986; Huang et al., 1996; Jones and Kaul, 1996; Hammoudeh et al., 2004; Kilian, 2008; Kilian furthermore, Park, 2009; Aloui and Jammazi, 2009; Scholtens and Yurtsever, 2012; Wen et al., 2012; Yaya et al., 2016; Ji et al., 2018; Gong and Lin, 2018a, 2018b).

Hence, volatility spillovers between the oil market furthermore, financial exchanges

are essential for vitality strategy creators, market members, portfolio enhancement and vitality hazard the executives; accordingly, this linkage between the oil market and securities exchanges has pulled in more consideration around the globe (Filis et al., 2011; Wen et al., 2012; Awartani and Maghyereh, 2013; Ewing and Malik, 2016; Maghyereh et al., 2017; Kang et al., 2017).

Notwithstanding, regardless of the way that the nearness of deviated instability in money related business sectors has for quite some time been perceived in the writing (Christie, 1982; French et al., 1987; Bollerslev et al., 2006; Chiou and Lee, 2009; Filis et al., 2011; Wen et al., 2012), furthermore, the correct measurement of such asymmetries is profoundly applicable to hazard valuation and portfolio enhancement methodologies (Patton, 2004; Knott et al., 2009; Garcia and Tsafack, 2011), little examination has zeroed in on the time-varying asymmetric volatility spillover among oil and securities exchanges in a quantitative manner; our paper fills this hole.

The early writing zeroed in on the return spillovers among oil and securities exchanges, wherein the regular econometric strategies applied to the return spillovers between raw petroleum and financial exchanges were the customary vector auto regressive (VAR) or vector mistake revision models (VECM) (Huang et al., 1996; Cong et al., 2008; Miller and Ratti, 2009; Gupta and Modise, 2013). For instance, Huang et al. (1996) utilized a VAR model to test the elements of associations between oil prospects returns and U.S stock returns during the 1980s, and they discovered that oil prospects influence singular oil organizations however not U.S stock returns.

Cong et al. (2008) utilized a VAR model to test the relationship between's global oil value returns and Chinese stock returns, and they found no factually huge effect from global oil value shocks on most Chinese stock value files. Mill operator and Ratti (2009) investigated the drawn out connection between the world cost of unrefined petroleum and global financial exchanges over 1971:1–2008:3 utilizing VECM. Gupta and Modise (2013) utilized a sign limitation basic VAR to test the elements between oil value shocks and South African stock returns. They found

that stock returns just increment with oil costs at the point when worldwide monetary action improves.

In addition, considers tending to the issue of instability spillovers between oil and stock markets utilize the regular econometric techniques of the multivariate GARCH-type models (Hammoudeh et al., 2004; Accioly and Aiube, 2008; Chang et al., 2010; Hammoudeh et al., 2010; Filis et al., 2011; Wen et al., 2012; Chkili et al., 2014; Guesmi and Fattoum, 2014; Kang et al., 2017). For example, Hammoudeh et al. (2010) inspected the effects of world-, nation, and part explicit factors on the stock return volatility of 27 US areas in the short-and since quite a while ago run and represented their uneven shocks based on GARCH models.

Filis et al. (2011) examined the time-changing connections between Brent oil costs and financial exchanges on both oil-bringing in and oil-trading nations. Utilizing a multivariate uneven DCC-GARCH approach, they discovered that the contingent change of oil and stock costs remains the same for oil-bringing in and oil-sending out economies Notwithstanding, time varying relationships rely upon the inception of the oil shocks: the reaction from total interest related shocks is a lot more noteworthy than supply related shocks beginning from OPEC's creation cuts. Guesmi and Fattoum (2014) utilize a multivariate GJR-DCC-GARCH way to deal with examine the co-developments and dynamic instability spillovers between oil costs and oil-trading and oil-bringing in nations; they decided that oil resources are not a decent 'place of refuge' for insurance against securities exchange misfortunes during times of strife.

2.6 Hypotheses of the Study

H_1: There exists a correlation between mean and volatility spillover from oil price to food sector among the oil exporting and importing countries.

H_2: There exists a dynamic conditional correlation among oil and food sector across oil exporting and importing countries.

H_3: There exists an asymmetric behavior of conditional correlation among the oil and food sector across oil exporting and importing countries.

Chapter 3

Research Methodology

3.1 Population and Sample of Study

In present study, use the daily data based on oil prices and food sector stock market indices from 01 January 2010 to 31 December 2019. The sample containing the only 3 oil-exporting states (Canada, Saudia Arabia, and Kuwait) and three oil importing countries (US, China, and India). The sample period is selected on the availability of data for all necessary series.

Regarding oil exporting countries, the country of Saudi Arabia is the varying on the number one oil distributor in the world and having the highest oil reserves. In the 1932 era, the country was accountable for 16.1% oil exporter globally in 2018, which amount $182.5 billion in value and Canada comes on number four with export of oil in the world. In 2018, the country exported $66.9 billion cost of the commodity, or 5.9%. Due to the size of the Athabasca oil sands, it is projected that Canada has more than 10% of the global oil stock. As a small unit, it is remarkable that Kuwait comes on sixth point to export the oil and reserves to the world. The country, recognized in 1752 and situated in the Arabian Peninsula, is about the size of Constitution State. In 2018, the country exported $51.7 billion volume of oil, such as 4.6% of the world's total part of oil trading from other countries.

Regarding oil importing countries, China imports US$239.2 billion (20.2% of total

crude oil imports), United States imports $163.1 billion (13.8% of total world imports), India imports $114.5 billion (9.7% of total world imports).

	Countries
Oil Importing Countries	China
	India
	US
	Saudi Arabia
Oil Exporting Countries	Canada
	Kuwait

3.2 Description of Variables

3.2.1 Food Sector Stock Prices

The following equation can be used to estimate the food sector stock prices return:

$$R_{j,p} = ln(P_{j,p}/P_{j,p-1}) \tag{3.1}$$

Where Rj,p denotes the current day return p; and Pj,p and Pj,p-1 are closing prices for current day p and previous day p-1 respectively.

3.2.2 Oil Prices

The some below equations can be taken to estimate the oil market return:

$$R_{k,t} = ln(O_{k,t}/O_{k,t-1}) \tag{3.2}$$

Where R k;t is the current day return t; and Ok,t and Ok, t-1are closing prices for current day t and previous day t-1 respectively.

3.3 Econometric Model

The methodology for the present study is split in two major parts. The first part of this study examines the return and instability transmission from oil prices –to food sector stock prices in Oil importing and oil exporting countries by using ARMA (1,1) GARCH In-Mean model presented by Liu and Pan (1997). In second part, time-fluctuating conditional correlations among different countries i.e. oil importing and oil exporting states are measured by using Dynamic Conditional Correlation (DCC) and Asymmetric-DCC (ADCC) Multivariate Generalized Autoregressive Conditional Heteroscedasticity (MV-GARCH) models planned by Engle (2002) and Cappiello et al. (2006), respectively.

3.3.1 Return and Volatility Spillover-Arma Garch

3.3.1.1 Oil Prices to Food Sector Stock Prices of Oil Importing and Exporting Countries

Two-stage GARCH-in-mean approach (GARCH-M), presented by Liu and Pan (1997) was used to determine the return and volatility program of oil prices to Food Sector stock prices of oil importer and oil exporter states. In the first stage, the relevant oil prices and stock prices sequence are modeled via an ARMA (1, 1)-GARCH (1, 1)-M econometric model.

$$r_{p,t} = \rho_0 + \rho_1 r_{p,t-1} + \rho_2 V_{p,t} + \rho_3 \varepsilon_{p,t-1} + \varepsilon_{p,t}\varepsilon_{p,t} \sim N(0_{,pt}) \tag{3.3}$$

$$V_{p,t} = w_0 + w_1 \mu^2_{p,t-1} + w_2 V_{p,t-1} \tag{3.4}$$

Where rp,t is the daily oil prices at time t and $\varepsilon_{i,t}$ is the error term. Basically, the major objective to include the ARMA (p,q) GARCH structure in the model is the adjustment of serial association in the data.

In another phase, the influence of return and instability transmission across marketplaces are determined by obtaining the consistent error term and its square in

the initial phase and putting them in to the equations of return and volatility of other markets also with the inclusion of a structural break as:

$$r_{q,t} = \rho_{q,0} + \rho_{q,1}.r_{q,t-1} + \rho_{q,2}.V_{q,t} + \rho_{q,3}.\varepsilon_{q,t-1} + \phi_q.\varepsilon_{p,t} + \varepsilon_{q,t}\varepsilon_{q,t} \sim N(0,_{q,t}) \quad (3.5)$$

$$V_{q,t} = w_{q,0} + w_{q,1}.\mu^2_{q,t-1} + w_{q,2}.V_{q,t-1} + \lambda_q e^2_{p,t} \quad (3.6)$$

Where $\varepsilon_{p,t}$ is the standardized error term for oil prices and is catching the mean return spillover outcome from these bases. In directive to determine the instability spillover, the exogenous variable $e^2_{p,t}$ - the square of the standardized error term is involved in the conditional volatility equation and is explained as $e^2_{p,t} = \varepsilon^2_{p,t} \diagup_{p,t}$.

3.3.2 Time-Varying Conditional Correlation - DCC and ADCC

DCC-GARCH (Engle, 2002) technique was functional to analyze the overflow among oil value shocks and stock returns. Beforehand, a comparative technique was implemented by McAleer et al. (2009), Arouri et al. (2012), (Guesmi & Fattoum, 2014; Lin, Wesseh Jr, & Appiah, 2014). DCC-GARCH permits the utilization of restrictive connection of various timeframes. This particular of DCC-GARCH is measured as the speculation of consistent restrictive relationship GARCH model projected by (Bollerslev, 1990). The above framework adopts the correlation is persistent over the period of the time but that correlation may be time varying. So in that case, dynamic conditional correlation DCC GARCH model is used and possibility of any asymmetry in the model will be captured by ADCC GARCH model. Dynamic Conditional Correlation model or DCC, models the volatilities and correlations in two steps. The detail about the dynamics of correlation is reached out to permit asymmetries vital for financial practice. The DCC furnishes a joint thickness work with tail dependence more prominent than the ordinary. This is investigated both by simulation and experimentally. The

time aggregated DCC is exhibited as a valuable copula for financial decision making.

At the point when two stocks move same way, the correlation is expanded marginally. On the opposite side, when similar two stocks move inverse way, this correlation is diminished. In down markets, this effect of movement of stocks can be stronger. The associations frequently are supposed to briefly deviate from a long run mean. A symmetric DCC model gives highest tail dependence for both upper and lower tails of the multi-period combined concentration while, an asymmetric DCC or ADCC provide higher tail dependence in the lower tail of the multi-period density.

• Dynamic Conditional Correlation DCC DCC is defined as:

$$Q_t = \overline{R} + \Sigma_{i=1}^{m} \pi_i (\epsilon_{t-i}) \acute{\epsilon}_{t-i} - \overline{R}) + \Sigma_{i=1}^{m} \epsilon_i (Q_{t-1} - \overline{R}) \tag{3.7}$$

For most of the data sets used in the research, DCC (1,1) is proved to be an adequate model.

• Diagonal Generalized GDCC

For the estimation of Diagonal Generalized DCC, the following steps are followed.

1. Choose a parameterization for P and Q as:

1. Choose a parameterization for P and Q as,

P= $\propto \acute{\propto} = \beta\acute{\beta}$

2. So that for any Z,

A.Z=diag($\propto$).Z diag ($\propto$)

3. Hence for any i and j,

$$Q_{i,j,t+1} = \overline{\vartheta}_{i,j} + \alpha_i \alpha_j (\epsilon_{i,t} - \overline{\vartheta}_{i,j}) + \beta_{ij} (Q_{i,j,t} - \overline{\vartheta}_{i,j}) \tag{3.8}$$

Asymmetric Dynamic Conditional Correlation ADCC

ADCC is defined as,

$$\sigma_t = min(\epsilon_{t,0}), \overline{N} = 1\Sigma_{t=1}^{t} \sigma_t \acute{\sigma}_t (3.9)$$

1. Asymmetry can be explained with terms that are zero excepting when both returns are negative such as,

$\mu\sigma_{i,t}\sigma_{i,t}$

2. Or more generally (and averaging to zero),

G($\sigma\acute{\sigma}$-N)

Asymmetric Generalized DCC AGDCC

The Asymmetric Generalized DCC can be expressed as,

$$Q_t = \overline{R} + A.(\epsilon_{t-1}\acute{\epsilon}_{t_{-1}-\overline{R})+B.(Q_{t-1}-\overline{R})+G.(\sigma_t\acute{\sigma}_{t-N)}} \quad (3.10)$$

And assuming a diagonal structure for A, B and G, the typical equation becomes:

$$Q_{i,j,t+1} = \overline{\vartheta}_{i,j} + \alpha_i\alpha_j(\epsilon_{i,t}\epsilon_{j,t} - \overline{\vartheta}_{i,j}) + \beta_i\beta_j(Q_{i,j,t} - \overline{\vartheta}_{i,j}) + \gamma_i\gamma_j(\sigma_{i,t}\sigma_{j,t} - N_{i,j}) \quad (3.11)$$

3.4 Expected Results

This study perceives the existence of association between oil prices and food sector as a part of the expected. There is also a significant spillover among oil price and food sector while oil price shock negatively influences food market stock returns.

3.5 Contribution of the Study

This study embarks on to present significant suggestions to investors, scholars and stakeholders in the wake of existence of linkage between oil price and food sector. For this purpose, the conclusions driven by our experimental investigation that amply predict the financial market volatility can be utilized. This study could develop a progressively common prospect for international investors those may bring a change in their priorities about stock markets replying to oil price variation as international shocks.

Chapter 4

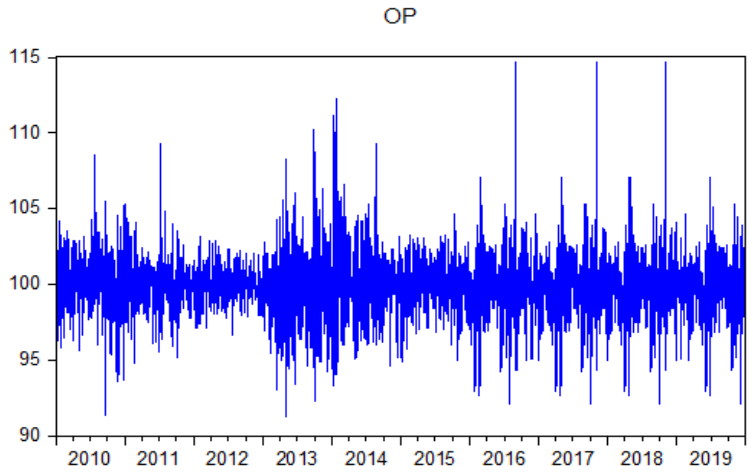
Data Analysis and Discussion

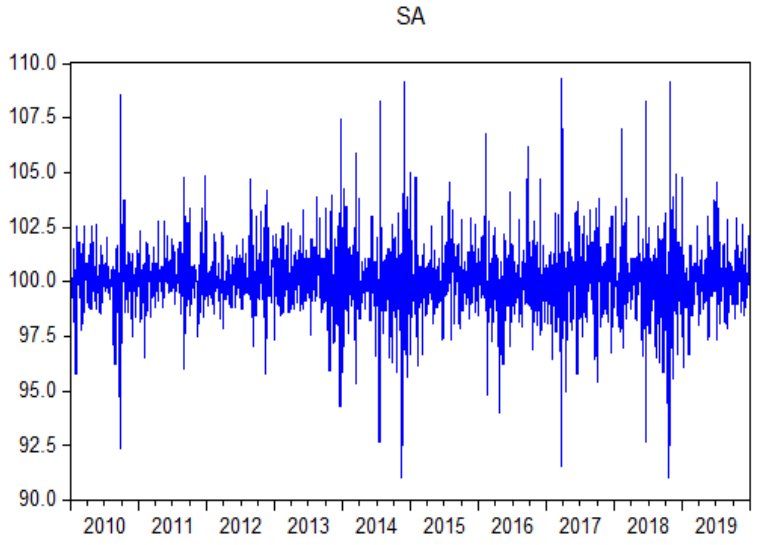
This chapter covers the various tests functional to explore the phenomena below discussion and interprets the outcomes gained.

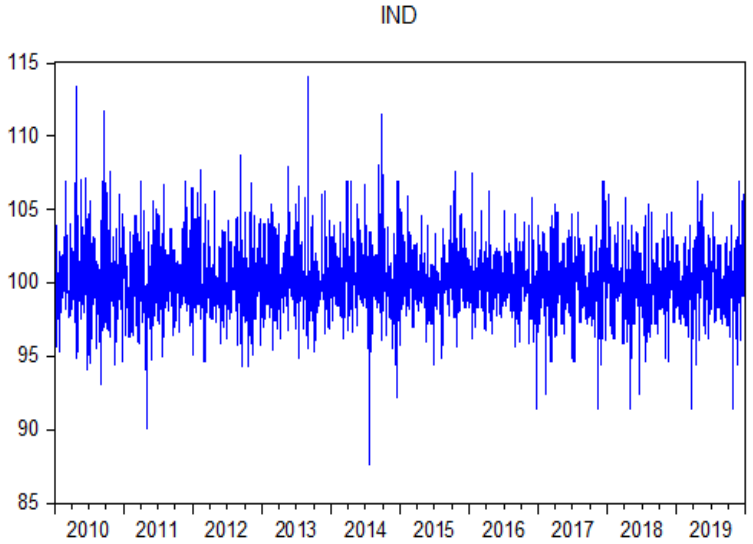
4.1 Graphical Representation

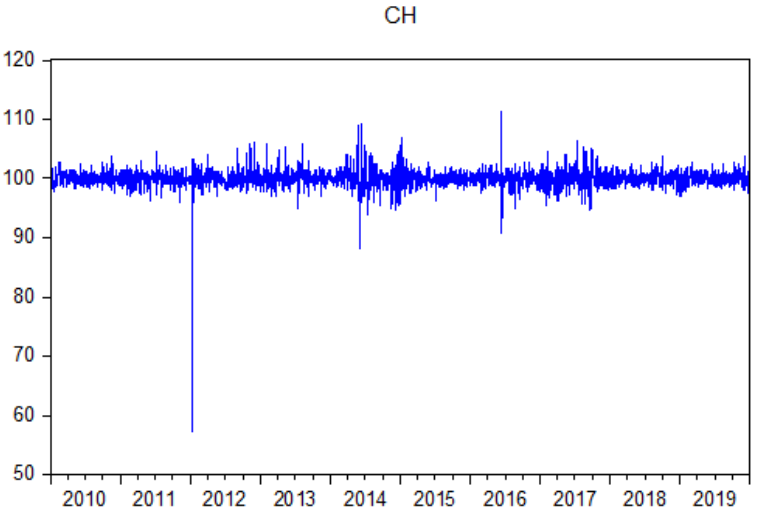
4.1.1 Stationarity of Series

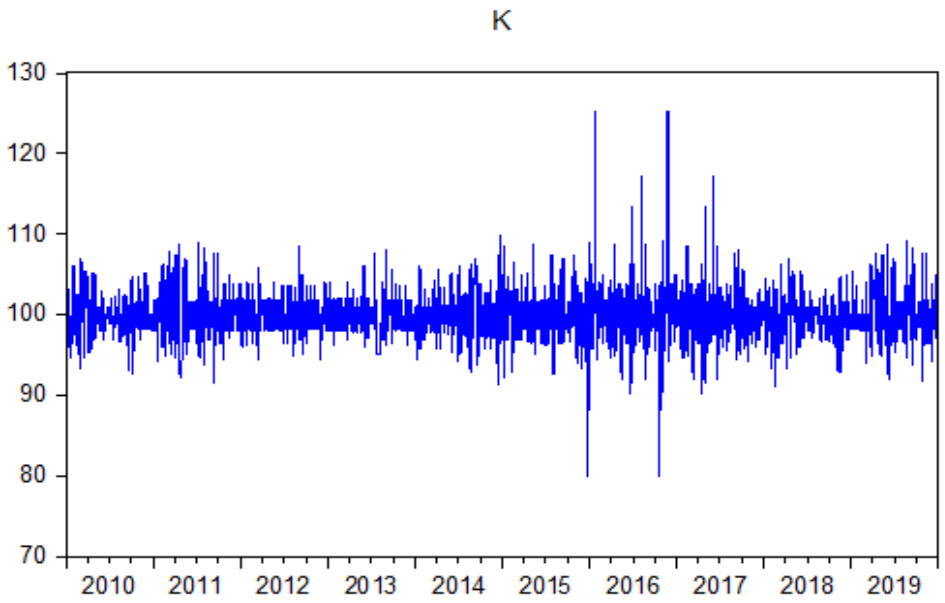
In research, the first basic step of every analysis is to see the behavior of data by visualization. Visualization of data means to check the Stationarity of series that, data must be stationary for further spillover analyses. In short, the mean of the series must be constant. All Stationarity graphs are attached in Appendix-B.

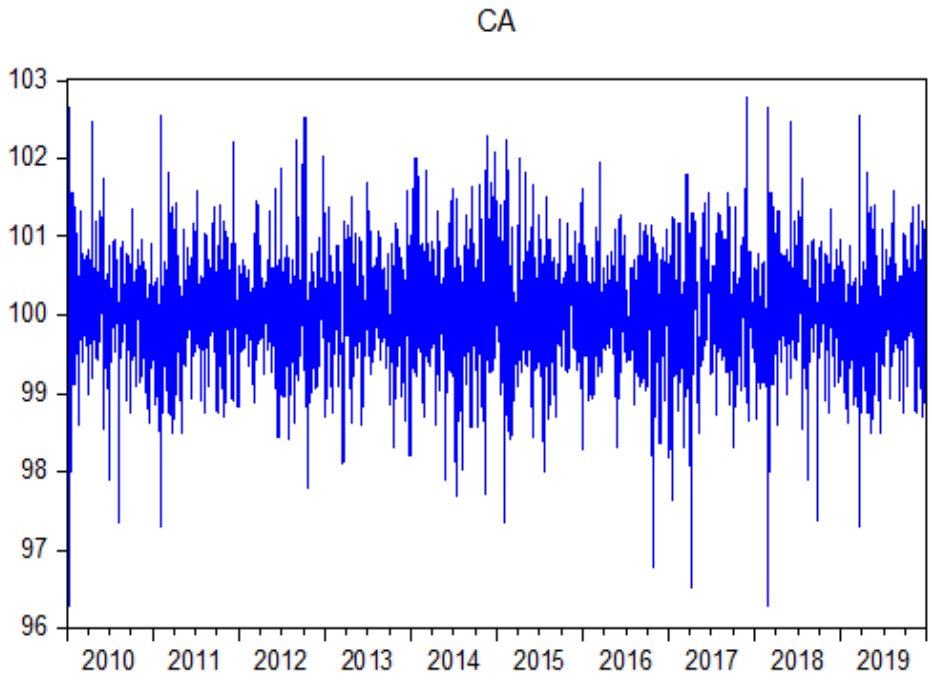



SA
110.0
107.5
105.0
102.5
100.0
97.5
95.0
92.5
90.0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019


IND
115
110
105
100
95
90
85
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019


CH
120
110
100
90
80
70
60
50
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019





4.2 Descriptive Statistics

The second step is to examine the behavior of data though descriptive statistics of each series including Independent and dependent variables. In this study, oil prices are independent and all countries food sector stock index are taken as dependent variables as show in the **Table: 4.1**.

Table: 4.1 includes the first 4 important moments i.e. Mean, Standard Deviation, Skewness and Kurtosis. Moreover, the blowout of data is also measured by Maximum & Minimum average replies. The sample period is occupied of 10 years starting from 01/01/2010 to 31/12/2019. The study employs the daily oil prices and 6 countries food sector stock indices.

Table 4.1: Descriptive Statistics

	Mean%	**Max.%**	**Min.%**	**SD%**	**Skewness**	**Kurtosis**
OP	0.049	19.2255	-17.7335	3.0258	0.324434	6.716657
FCH	0.0259	80.2399	-42.8566	2.3202	9.982826	429.4716
FCA	-0.0045	6.6049	-4.06	0.8505	0.389556	7.751237
FUS	-0.0099	9.142	-7.7038	1.2788	0.251095	7.549276
FSA	0.0158	19.3771	-11.2279	1.7578	0.765695	14.43923
FK	0.0662	23.9319	-22.3519	3.6499	0.536936	8.552656
FIND	0.0365	13.985	-16.2397	2.6205	-0.002718	5.954525

Average mean return measures the performance of the stock indices of different countries. The study reports that mean return of all countries are positive except Canada-CA and United States-US. The maximum mean return value is of Kuwait-FK that is (0.0662%) and lower is United States-FUS that is (-0.0099%). In accumulation, all countries have positive standard deviation. Therefore, Kuwait-K exhibits the higher volatility (3.6499%) while Canada-CA exhibits the lowest volatility (0.8505%). Maximum and minimum statistics show the max and min return produced/day for each country. For instance, the average return/day for China-CH is (0.0259%), maximum return earned /day is (80.2399%) and minimum return earned or max loss earned/day is (-42.8566%) and so on.

Skewness shows that the asymmetric conduct of data. Skewness value of India – FIND examines that distribution of return is negatively skewed which means long left tail and more lower values than sample mean and remaining all shows positively Skewed which means long right tail, more high values than the sample mean. Kurtosis tells about the tiredness of the probability circulation.

These values of kurtosis are positive and greater than 3 that indicate, all series

are leptokurtic i.e. fat tails with high peak and become extremely influenced with the bubbles of stock market.

4.3 Return and Volatility Spillovers from Oil Prices-to-Food Sector Stock Prices-ARMA GARCH Model

After preliminary analyses, the first part of methodology is to determine the return and instability spillover from oil prices to food sector stock indices by using a suitable econometric model.

Table: 4.2, shows the estimates of return and instability spillovers from oil prices to food sector stock indices by means of an ARMA GARCH (p,q) model. All ARCH and GARCH coefficients are also described with their p-value (in parenthesis). For all countries except United States ρ_1 is originate to be significant and positive means, the mean returns of these countries could be projected by consuming previous prices conduct.

In short meaning, market is inefficient for United States that indicate, there exists no opportunities of diversification in this country. On the other hand, for United States there was no effect on today's returns from past price behavior, which means that this market is efficient and provide investment opportunities. Investors can take advantage of diversification.

The GARCH coefficient ρ_2 is only significant for Canada-FCA and India-FIND which shows that, mean returns can be predicted by using forecasted volatility. The coefficient of standardized residual error term, ρ_3 also has a significant negative influence on all the states that shows, these markets make some necessary adjustments for the next day on the source of past shocks. Simply, the market will move opposite to make correction. The coefficient of

ω_1 is significant and positive for all countries which indicate that, volatility of the present period could be predicted by means of the past prices conduct.

TABLE 4.2: Return and Volatility Spillover of Oil Prices and Food Sector Stock Indices Arma Garch Model

	OP	**FUS**	**FCA**	**FCH**	**FSA**	**FK**	**FIND**
ρ_0	-0.000243	-0.000962	-0.000319	0.000652	-0.000535	0.000167	0.001443
	(0.6855)	(0.5116)	(0.2949)	(0.0142)	(0.0304)	(0.8409)	(0.2739)
ρ_1	-0.0394	0.189869	0.273146	0.295342	0.268633	0.16343	0.355132
	(0.1230)	(0.0204)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ρ_2	0.327169	7.045575	6.01275	-0.933999	4.824206	0.101446	-2.313921
	(0.7808)	(0.1727)	(0.2950)	(0.3376)	(0.0000)	(0.9102)	(0.3369)
ρ_3	-0.663141	-0.725818	-0.776666	-0.853866	-0.764888	-0.727905	-0.784047
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ϕ	-	8.23E-05	-0.000101	-5.71E-05	-6.32E-06	-0.0005	0.000292
	-	(0.7939)	(0.3635)	(0.8390)	(0.9631)	(0.2880)	(0.4245)
ω_0	5.14E-06	0.000106	1.28E-05	7.19E-05	2.10E-05	8.74E-05	0.000202
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ω_1	0.069428	0.15	0.170123	0.368697	0.212529	0.159324	0.13777
	(0.0000)	(0.0005)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ω_2	0.924585	0.6	0.596288	0.225573	0.715088	0.724855	0.521641
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ϑ	-	-4.23E-09	7.11E-11	2.46E-08	-1.22E-09	1.35E-08	-3.69E-09
	-	(0.0000)	(0.5376)	(0.0000)	(0.0000)	(0.0000)	(0.0020)

Coefficient of ω_2 is also significant and positive for all countries that provides the suggestion about determination of the instability. Aloui (2007) examines the same association among stock returns and exchange rate and finds the persistence of volatility in his study as well.

4.4 Time Varying Conditional Correlation-DCC and ADCC

As it is discussed in the methodology that, ARMA GARCH model only incorporate the effect of spillovers by taking the supposition of Constant Conditional Correlation CCC. But if the correlation is time varying, then Dynamic Condition Correlation DCC model is used in this investigation. Moreover, the effects of any asymmetry is also captured by using the extended version of DCC model that is, Asymmetric Dynamic Conditional Correlation ADCC.

DCC MV - GARCH Models & Estimates Between Oil prices and food sector stock indices **Tables: 4.3** and **Tables: 4.4** show the suitable uni-variate DCC models and estimates from oil prices to food sector stock indices of oil importing and oil exporting countries, respectively. The appropriate model is preferred on the source of lowest possible Akaike Evidence Criteria - AIC.

Table 4.3: DCC MV–GARCH Models B/W Oil Prices and Food Sector Stock Indices

S.No	**Countries**	**Model**
1	FUS	EGARCH
2	FCA	EGARCH
3	FCH	EGARCH
4	FSA	GJR/TARCH
5	FK	EGARCH
6	FIND	EGARCH

Table 4.4, summarizes the results of DCC GARCH model among oil prices and food segment stock guides of oil importing and oil exporting countries. This table reports the influence of the past residual shocks ($\theta 1$) and lagged dynamic conditional association ($\theta 2$) with their particular p-values. The initial condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta 1 + \theta 2 < 1$).

TABLE 4.4: DCC MV-GARCH Estimates between Oil Prices and Food Sector Stock Indices

Countries	**Oil Prices**	
	$\theta 1$	$\theta 2$
FUS	0.007445	0.960915
	-0.2235	0
FCA	-0.006119	0.861043
	-0.4862	0
FCH	0.005235	0.935198
	-0.3785	0
FSA	0.000299	0.786627
	-0.9713	-0.7772
FK	0.019229	0.104509
	-0.2744	-0.8292
FIND	-0.015506	0.785771
	0.0000	0.0000

All countries effectively met the compulsory constancy condition. It means, DCC model must be used for evaluating the time fluctuating conditional association. For $\theta 1$ all the significant variations imply that, there exists the impact of past residual shocks on correlation.

The Parameters of $\theta 1$ is found to be highly significant for United States-FUS, Kuwait-FK, India – FIND & Canada –FCA which indicates that, there exists the lagged dynamic conditional correlation in these countries while, the same parameters of $\theta 2$ is found significant for only Saudia Arbia–FSA and Kuwait-FK which indicated the impact of partial lagged dynamic conditional correlation exists. And it is not found significant for any other country which indicates the impact of partial lagged dynamic conditional correlation doesn't exists.

For $\theta 1$ all the significant variations imply that, there exists the impact of past residual shocks on correlation.

4.5 ADCC MV-GARCH Models and Estimates between Oil Prices and Food Sector Stock Indices

Tables: **4.4** and 4.5 show the suitable uni-variate DCC models and estimates form oil prices to food sector stock indices, respectively. **Table 4.5**, covers the estimates of ADCC GARCH model oil prices and food sector stock indices. The first two parameters of this table are same as that of DCC GARCH models i.e. the influence of the past residual shocks ($\theta 1$) and lagged dynamic conditional correlation ($\theta 2$).

Table 4.5: ADCC MV-GARCH Models between Oil Prices and Food Sector Stock Indices

C	Countries	Model
1	FUS	EGARCH
2	FCA	EGARCH
3	FCH	GARCH
4	FSA	GJR/TARCH
5	FK	EGARCH
6	FIND	EGARCH

An additional parameter of ($\theta 3$) is used in this model that provides the information about the shocks of positive and negative news on dynamic conditional correlation. Like previous model of DCC, the first condition that is the stability of model is also met in all countries (i.e. $\theta 1 + \theta 2 < 1$). It means, the model is stable.

The parameters of $\theta 1$ show a highly significant positive influence of previous residual shocks on correlation for India FIND. The parameters of $\theta 2$ is found to be highly significant for United States FUS, Canada FCA, China FCH, Saudi Arabia FSA, and India FIND which indicates that, there exists the lagged dynamic conditional correlation in these countries. The parametric values of $\theta 3$ is not significant for any country that indicates, the correlation is not increased with the effect of negative news while, it means all countries show variations with respect to asymmetric effect.

TABLE 4.6: ADCC MV-GARCH Estimates between Oil Prices and Food Sector Stock Indices

Countries	**Oil Prices**		
	$\theta 1$	$\theta 2$	$\theta 3$
FUS	0.00742	0.958724	0.00084
	-0.218	0	-0.8698
FCA	-0.005107	0.830498	-0.004704
	-0.5995	-0.0003	-0.7795
FCH	-0.000152	0.910401	0.006401
	-0.9503	0	-0.2493
FSA	0.001977	0.882207	-0.00679
	-0.8457	0	-0.6351
FK	0.010033	0.312701	0.034325
	-0.5868	-0.4403	-0.3213
FIND	-0.015483	0.779955	-0.002778
	0.0000	0.0000	-0.8359

In short, any good or bad news arises in market, will affect the correlation. From the both tables reported above, it is clear that ADCC model provides more reliable and authentic results as compared to DCC because it is also capturing the asymmetric effect between the series. So, we can say that the most of the countries in this study show significant time variation in its conditional correlations and few of them show asymmetric behavior.

Chapter 5

Discussion and Conclusion

This study emphasizes to examine the mean and volatility spillover of oil price on stock prices of food sector as it sets out to acquire a critical implication for scholars, policy makers as well as investors. The stockholders as well as decision makers can make use of the results generated by this study to draw out accurate forecasting the volatility of oil price. This investigation delved into mean and volatility spillover from crude oil to food sector stocks of oil importing and exporting nations was examined. Three top oil importing countries (China, India, US) and three oil exporting countries (i.e. Canada, Saudi Arabia, Kuwait) were taken as a sample for this study.

The research premise conceived by this study included day to day oil prices as well as daily stock prices from food sector related firms while index was got developed using stock index of companies relating to food sector since January 1, 2000 till date December 31, 2019 ARMA GARCH model was utilized on the basis of entire the closing prices employed for the purpose of calculation.

The conditional correlation was evaluated resulting Engle's (2002) DCC-GARCH model, including all the conditional variances were considered for purpose of evaluation (Glosten, Jagannathan, & Runkle, 1993).

Saudis get their premium income generated through oil and oil related products above 86%. Consequently, the reducing or augmentation the oil costs influences monetary pointers directly on the landscape of stock markets (Alturki and Khan,

2015). Alturki and Khan (2015) additionally articulated that as oil costs significantly diminish on the worldwide showcase, it has a prompt monetary effect in its trail as perceived by the speculator.

Kilian and Park (2007) reported an outcome from the context of the United States and found a slightly fewer influence on oil market shocks the securities exchange both in short and long run. The results emanating from return spillover were positive in relation to Kuwait-K as well as India-IND. The positive sign given by Kuwait-K indicates that returns by these countries are growing regarding changes in oil prices. In other words, good news brings the rise in returns while bad news decrease the returns in both Kuwait as well as India. On the same grounds, volatility spillover as a result of oil prices from many other countries was observed as well pertaining to Canada-CA as well as India-IND.

As the standardized residual error term is negative for all countries so size of the shock was observed for decision on the basis of good or bad news. All countries reflect a significant but negative volatility spillover regarding oil prices. In other words, small shocks are creating high volatilities in these countries. Simply, if a shock of depreciation experiences, the people will prefer less trading and slow down the process which in turn serves to reduce the volatility in market due to decrease in trading.

The other side reflects almost all countries strongly reflect the existence of return and volatility spillover among them. All the coefficients of return and volatility spillover are significantly positive that means the returns of one country increasing the returns of other countries. In simple words, we can say that all countries show a strong linkage with each other. So, any change occurs in one country quickly transmits to the remaining ones that indicates all these countries are linked with each other. The second aspect of the study covers the extension of previous model. As the correlation between the variables is found time bound, so Dynamic Condition Correlation DCC model finds its application while asymmetric conduct is assessed by Asymmetric Dynamic Conditional Correlation ADCC.

Results driven by both these models are found significantly positive for most of the targeted countries. Mostly the significant variations and stability of models

show that, correlation is not continuous so dynamic conditional correlation model is strongly suggested. While, for some countries, the stability of the model is not met that indicates, correlation in these countries is not time bound so DCC and ADCC models are not applied. The implications of DCC and ADCC models provide strong conceptual understandings that, countries are interconnected to each other and with the passage of time, correlation also develops time fluctuating.
The study is able to get evidence that time-fluctuating relationship of oil and stock costs undertake no variation for oil importing as well as oil exporting economies. This feature can be clarified with the help of two realities. Total interest side oil value shocks because of the means that are carried about by vacillations in the international business cycle relied upon to influence every single securities exchange in the equivalent style. The finding that the preparatory interest side oil value stuns will in general impact oil importing as well as oil exporting nations in the equivalent source creditable to the way that the oil field under the analysis of oil importing nations is somewhat slight that the impacts of the vulnerability of any prospective supply deficiencies of raw petroleum, and demand of crude oil, are found fundamentally fewer.

5.1 Conclusion

The commodity markets present an avenues of attractive investment as an alternate financial markets. As seen as alternate investment areas, commodity prices are required to show response to the similar factors as financial prices of asset. One factor to this effect comes through shocks to oil price. The receptiveness of financial returns viz shocks to oil price was given a lot of research attention in the pertinent literature. However, the links between commodity and energy market links have recently attracted attention. In the relationship of commodity price and energy price, food prices have been the least studied.
Countries where commodity trade is more relied upon are more susceptible to risk and improbability in relation to commodity prices. Price instability upsets producers, financial intermediaries, investors, and policy framers besides inflicting

negative effects on growth as well as income distribution. Volatility is seen as a key basis behind price instability while its significance still holds ground owing to taking measures on account of liberalization, reducing barricades to trade, as well as globalization.

Though a developed commodity derivatives based market is available to lodge hedging against the risk of commodity price, but problems still persist in the wake of low accessibility to such markets, spread among local as well as international prices, low liquidity, privation in local reference prices, lacking derivative instruments relating to certain commodities. The point of transferring volatility across commodity markets pushes producers, traders and policy makers towards hard decisions. If there exists no volatility spillover among alternative commodity markets, this warrants the need to apply market based approaches to diversify risk. However, with the view to risk transmission as evidence, customary methods like buffer stocks, regulations, buffer funds, as well as international agreements are likely to be utilized.

This research study has been able to investigate the mean and volatility spillover among world oil, and food price indexes. It was found that no volatility spillover exists as of the oil returns towards the food returns. As a whole, our results designate only a concomitant linkage among oil and food products reflecting a risk reducing benefits based on two price indexes relating to portfolio formation.

Moreover, policy framers could hardly make use of developments occurring around the global oil market for making improvement in their forecasts relating to the food prices as well as volatilities. Our results however, could not get support of the claim that the inflation occurring in food prices is due to hikes in oil price. It is however, recognized that fluctuation in oil prices have documented fluctuations in mean and volatilities of the food commodities markets. Our results 'prove vigorous to the VAR lag structure.

5.2 Recommendations

- The mean overflow transmitted from oil market to food sector stock based

on indices of India, China, Saudi Arabia, Canada, United States, and Kuwait that impacts the value return. Entrepreneurs must know that varieties in oil market may similarly impact their portfolios return.

- As the volatility overspills may undergo transmission from oil market to the importing and exporting nations such as India, China, Saudi Arabia, United States, Canada, and Kuwait stock lists that is indicative of the fact that worldwide value markets are not autonomous about the variety in oil cost so financial professionals ought to encage elements pertaining to oil cost to address the impact of oil value.

- Variety in oil cost affects food sector stock indices of oil importing and exporting nations since the oil should be taken as key input variable to the economy.

- Strategy developers and investors should consistently watch the fluctuations in oil cost to detect the change in oil showcase instability to value showcase with the goal that it may adversely influence the growth in stock records.

5.3 Future Research Directions

Further research investigative the mechanism of information transmission and comparing oil prices with individual prices carried by different food items (i.e., wheat, corn, soybean etc.) may retrieve fruitful knowledge. The price as well as volatility spillover coming from world markets to domestic markets present an area that needs to conduct new investigations. Seeing the growing importance of commodity markets as assets, the dynamic association of commodity prices with financial markets carries immense significance for investors, traders, producer, policy makers as well as scholars.

Bibliography

Abel, A. B., & Bernanke, B. S. (2001). Macroeconomics, 4. bs. Boston, San Francisco, New York: *Addison Willey Longman inc*, 10(2), 16-38.

Al-Fayoumi, N. A. (2009). Oil prices and stock market returns in oil importing countries: The case of Turkey, Tunisia and Jordan. *European Journal of Economics, Finance and Administrative Sciences*, 16(1), 84-98.

Al Janabi, M. A., Hatemi-J, A., & Irandoust, M. (2010). An empirical investigation of the informational efficiency of the GCC equity markets: evidence from bootstrap simulation. *International Review of Financial Analysis*, 19(1), 47-54.

Aloui, C. (2007). Price and volatility spillovers between exchange rates and stock indexes for the pre-and post-euro period. *Quantitative Finance*, 7(6), 669-685.

Apergis, N., & Miller, S. M. (2009). Do structural oil-market shocks affect stock prices? *Energy Economics*, 31(4), 569-575.

Arouri, M. E. H., Jouini, J., & Nguyen, D. K. (2012). On the impacts of oil price fluctuations on European equity markets: Volatility spillover and hedging effectiveness. *Energy Economics*, 34(2), 611-617.

Arouri, M. E. H., & Nguyen, D. K. (2010). Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade. *Energy Policy*, 38(8), 4528-4539.

Aumeboonsuke, V., & Dryver, A. L. (2014). The importance of using a test of weak-form market efficiency that does not require investigating the data first. *International Review of Economics & Finance*, 33(1), 350-357.

Awartani, B., & Maghyereh, A. I. (2013). Dynamic spillovers between oil and stock markets in the Gulf Cooperation Council Countries. *Energy Economics*, 36(1), 28-42.

Bachelier, L. (1900). Théorie de la spéculation. Paper presented at the Annales scientifiques de l'École normale supérieure, 12(1), 184-198.

Backus, D. K., & Crucini, M. J. (2000). Oil prices and the terms of trade. *Journal of International Economics*, 50(1), 185-213.

Balke, N. S., Brown, S. P., & Yucel, M. K. (2002). Oil price shocks and the US economy: Where does the asymmetry originate? *The Energy Journal*, 23(3), 124-134.

Barsky, R. B., & Kilian, L. (2004). Oil and the Macroeconomy since the 1970s. *Journal of Economic Perspectives*, 18(4), 115-134.

Basher, S. A., Haug, A. A., & Sadorsky, P. (2012). Oil prices, exchange rates and emerging stock markets. *Energy Economics*, 34(1), 227-240.

Basher, S. A., & Sadorsky, P. (2006). Oil price risk and emerging stock markets. *Global Finance Journal*, 17(2), 224-251.

Bernanke, B. S. (2006). Reflections on the yield curve and monetary policy, 4(1), 156-168.

Bjørnland, H. C. (2009). Oil price shocks and stock market booms in an oil exporting country. *Scottish Journal of Political Economy*, 56(2), 232-254.

Bollerslev, T. (1990). Modelling the coherence in short-run nominal exchange rates: a multivariate generalized ARCH model. *The Review of Economics and Statistics*, 24(4), 498-505.

Bouri, E., Awartani, B., & Maghyereh, A. (2016). Crude oil prices and sectoral stock returns in Jordan around the Arab uprisings of 2010. *Energy Economics*, 56(1), 205-214.

Boyer, M. M., & Filion, D. (2007). Common and fundamental factors in stock returns of Canadian oil and gas companies. *Energy Economics*, 29(3), 428-453.

Broadstock, D. C., Cao, H., & Zhang, D. (2012). Oil shocks and their impact on energy related stocks in China. *Energy Economics*, 34(6), 1888-1895.

Brown, S. P., & Yücel, M. K. (2002). Energy prices and aggregate economic activity: an interpretative survey. *The Quarterly Review of Economics and Finance*, 42(2), 193-208.

Bruno, M., & Sachs, J. (1982). Input price shocks and the slowdown in economic growth: the case of UK manufacturing. *The Review of Economic Studies*, 49(5), 679-705.

Campbell, C. J. (1997). The Coming Oil Crisis: Multi- Science Publishing Co. Ltd, 12(1), 211-228.

Cappiello, L., Engle, R. F., & Sheppard, K. (2006). Asymmetric dynamics in the correlations of global equity and bond returns. *Journal of Financial Econometrics*, 4(4), 537-572.

Chen, N.-F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *Journal of Business*, 45(13), 383-403.

Chittedi, K. R. (2012). Do oil prices matters for Indian stock markets? An empirical analysis. *Journal of Applied Economics and Business Research*, 2(1), 2-10.

Choi, K., & Hammoudeh, S. (2010). Volatility behavior of oil, industrial commodity and stock markets in a regime-switching environment. *Energy Policy*, 38(8), 4388-4399.

Church, N. (2005). Why Our Food is So Dependent on Oil: Powerswitch (UK), 8(3), 114-128.

Ciner, C., Gurdgiev, C., & Lucey, B. M. (2013). Hedges and safe havens: An examination of stocks, bonds, gold, oil and exchange rates. *International Review of Financial Analysis*, 29(1), 202-211.

Cunado, J., & Perez, F. (2005). Oil prices, economic activity and inflation:evidence for some Asian countries. *The Quarterly Review of Economics and Finance*, 20(10), 65-83.

Davis, S. J., & Haltiwanger, J. (2001). Sectoral job creation and destruction responses to oil price changes. *Journal of Monetary Economics*, 48(3), 465-512.

Driesprong, G., Jacobsen, B., & Maat, B. (2008). Striking oil: another puzzle? *Journal of Financial Economics*, 89(2), 307-327.

Dutta, P., & Noor, M. H. (2017). Impact of oil volatility shocks on global emerging market stock returns. *International Journal of Managerial Finance*, 13(5), 578-591.

Dyckman, T. R., Morse, D. C., & Bierman, H. (1994). Cost accounting: concepts and managerial applications: *South-Western Pub*, 34(12), 244-258.

El-Sharif, I., Brown, D., Burton, B., Nixon, B., & Russell, A. (2005). Evidence on the nature and extent of the relationship between oil prices and equity values in the UK. *Energy Economics*, 27(6), 819-830.

Elder, J., & Serletis, A. (2010). Oil price uncertainty. *Journal of Money, Credit and Banking*, 42(6), 1137-1159.

Engle, R. (2002). Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. *Journal of Business & Economic Statistics*, 20(3), 339-350.

Ewing, B. T., & Thompson, M. A. (2007). Dynamic cyclical comovements of oil prices with industrial production, consumer prices, unemployment, and stock prices. *Energy Policy*, 35(11), 5535-5540.

Faff, R., & Brailsford, T. J. (2000). A Test of a Two-Factor 'Market and Oil'Pricing Model. *Pacific Accounting Review*, 10(2), 324-338.

Faff, R. W., & Brailsford, T. J. (1999). Oil price risk and the Australian stock market. *Journal of Energy Finance & Development*, 4(1), 69-87.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383-417.

Fernández-Macho, J. (2012). Wavelet multiple correlation and cross-correlation: A multiscale analysis of Eurozone stock markets. *Physica A: Statistical Mechanics and its Applications*, 391(4), 1097-1104.

Filis, G. (2010). Macro economy, stock market and oil prices: do meaningful relationships exist among their cyclical fluctuations? *Energy Economics*, 32(4), 877-886.

Fisher, I. (1930). Theory of interest: as determined by impatience to spend income and opportunity to invest it: *Augustusm Kelly Publishers, Clifton*, 26(12), 76-88.

Frankel, R., & Li, X. (2004). Characteristics of a firm's information environment and the information asymmetry between insiders and outsiders. *Journal of Accounting and Economics*, 37(2), 229-259.

Gisser, M., & Goodwin, T. H. (1986). Crude oil and the macroeconomy: Tests of some popular notions: Note. *Journal of Money, Credit and Banking*, 18(1), 95-103.

Glosten, L. R., Jagannathan, R., & Runkle, D. E. (1993). On the relation between the expected value and the volatility of the nominal excess return on stocks. *The Journal of Finance*, 48(5), 1779-1801.

Green, M. B. (1978). Eating oil. Enerdy use in food production: *Westview Press Inc*, 8(4), 46-60.

Grossman, S. J., & Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *The American Economic Review*, 70(3), 393-408.

Guesmi, K., & Fattoum, S. (2014). Return and volatility transmission between oil prices and oil-exporting and oil-importing countries. *Economic Modelling*, 38(1), 305-310.

Hadi, M. M. (2006). Review of capital market efficiency: Some evidence from Jordanian market. *International Research Journal of Finance and Economics*, 3(3), 13-27.

Hamao, Y. (1988). An empirical examination of the arbitrage pricing theory: Using Japanese data. *Japan and the World Economy*, 1(1), 45-61.

Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. *Journal of Political Economy*, 91(2), 228-248.

Hamilton, J. D. (1996). This is what happened to the oil price-macroeconomy relationship. *Journal of Monetary Economics*, 38(2), 215-220.

Hamilton, J. D. (2003). What is an oil shock? *Journal of Econometrics*, 113(2), 363-398.

Hamilton, J. D. (2009). Causes and Consequences of the Oil Shock of 2007-08: *National Bureau of Economic Research*, 54(21), 304-318.

Hamma, W., Jarboui, A., & Ghorbel, A. (2014). Effect of oil price volatility on Tunisian stock market at sector-level and effectiveness of hedging strategy. *Procedia Economics and Finance*, 13(1), 109-127.

Hammoudeh, S., & Li, H. (2004). The impact of the Asian crisis on the behavior of US and international petroleum prices. *Energy Economics*, 26(1), 135-160.

Heni, B., & Mohamed, B. (2011). A wavelet-based approach for modelling exchange rates. *Statistical Methods & Applications*, 20(2), 201-220.

Henriques, I., & Sadorsky, P. (2008). Oil prices and the stock prices of alternative energy companies. *Energy Economics*, 30(3), 998-1010.

Hong, H., Torous, W., & Valkanov, R. (2002). Do industries lead the stock market? Gradual diffusion of information and cross-asset return predictability, 44(13), 310-324.

Hooker, M. A. (1996). What happened to the oil price-macroeconomy relationship? *Journal of Monetary Economics*, 38(2), 195-213.

Huang, R. D., Masulis, R. W., & Stoll, H. R. (1996). Energy shocks and financial markets. *Journal of Futures Markets*, 16(1), 1-27.

Jiménez-Rodríguez*, R., & Sánchez, M. (2005). Oil price shocks and real GDP growth: empirical evidence for some OECD countries. *Applied Economics*, 37(2), 201-228.

Jones, C. M., & Kaul, G. (1996). Oil and the stock markets. *The Journal of Finance*, 51(2), 463-491.

Jones, D. W., Leiby, P. N., & Paik, I. K. (2004). Oil price shocks and the macroeconomy: what has been learned since 1996. *The Energy Journal*, 25(2), 234-262.

Jung, H., & Park, C. (2011). Stock market reaction to oil price shocks: a comparison between an oil-exporting economy and an oil-importing economy. *J. Econ. Theory Econ*, 22(3), 14-26.

Kaneko, T., & Lee, B.-S. (1995). Relative importance of economic factors in the US and Japanese stock markets: *Elsevier*, 12(3), 82-94.

Kaul, G., & Seyhun, H. N. (1990). Relative price variability, real shocks, and the stock market. *The Journal of Finance*, 45(2), 479-496.

Khalfaoui, R., Sarwar, S., & Tiwari, A. K. (2019). Analysing volatility spillover between the oil market and the stock market in oil-importing and oil-exporting countries: Implications on portfolio management. *Resources Policy*, 62(32), 22-32.

Kilian, L. (2009). Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. *American Economic Review*, 99(3), 1053-1069.

Kilian, L., & Park, C. (2007). The Impact of Oil Prices on the US Stock Market: *CEPR Discussion Paper*, 16(6), 102-118.

Kilian, L., & Park, C. (2009). The impact of oil price shocks on the US stock market. *International Economic Review*, 50(4), 1267-1287.

Kim, I.-M., & Loungani, P. (1992). The role of energy in real business cycle models. *Journal of Monetary Economics*, 29(2), 173-189.

Kim, S., & In, F. (2007). On the relationship between changes in stock prices and bond yields in the G7 countries: Wavelet analysis. *Journal of International Financial Markets, Institutions and Money*, 17(2), 167-179.

Kling, J. L. (1985). Oil price shocks and stock market behavior. *The Journal of Portfolio Management*, 12(1), 34-39.

Kroner, K. F., & Ng, V. K. (1998). Modeling asymmetric comovements of asset returns. *The Review of Financial Studies*, 11(4), 817-844.

Kroner, K. F., & Sultan, J. (1993). Time-varying distributions and dynamic hedging with foreign currency futures. *Journal of Financial and Quantitative Analysis*, 4(1), 535-551.

Lardic, S., & Mignon, V. (2006). The impact of oil prices on GDP in European countries: An empirical investigation based on asymmetric cointegration. *Energy Policy*, 34(18), 3910-3915.

LeBlanc, M., & Chinn, M. D. (2004). Do high oil prices presage inflation? The evidence from G-5 countries. *UC Santa Cruz Economics Working Paper* (561)(24), 4-14.

Lescaroux, F., & Mignon, V. (2008). On the influence of oil prices on economic activity and other macroeconomic and financial variables. *OPEC Energy Review*, 32(4), 343-380.

Lin, B., Wesseh Jr, P. K., & Appiah, M. O. (2014). Oil price fluctuation, volatility spillover and the Ghanaian equity market: Implication for portfolio management and hedging effectiveness. *Energy Economics*, 42(1), 172-182.

Liu, Y. A., & Pan, M.-S. (1997). Mean and volatility spillover effects in the US and Pacific-Basin stock markets. *Multinational Finance Journal*, 4(1), 47-62.

Malik, F., & Hammoudeh, S. (2007). Shock and volatility transmission in the oil, US and Gulf equity markets. *International Review of Economics & Finance*, 16(3), 357-368.

Malkiel, B., & Fama, E. (1970). Efficient capital markets. *A Review of Theory and Empirical Work Journal of Finance* 25(1), 383, 417.

Malkiel, B. G. (2003). The efficient market hypothesis and its critics. *Journal of Economic Perspectives*, 17(1), 59-82.

Managi, S., & Okimoto, T. (2013). Does the price of oil interact with clean energy prices in the stock market? *Japan and the World Economy*, 27(4), 1-9.

McSweeney, E. J., & Worthington, A. C. (2008). A comparative analysis of oil as a risk factor in Australian industry stock returns, 1980-2006. *Studies in Economics and Finance*, 4(3), 123-136.

Miller, J. I., & Ratti, R. A. (2009). Crude oil and stock markets: Stability, instability, and bubbles. *Energy Economics*, 31(4), 559-568.

Mohammadi, H., & Su, L. (2010). International evidence on crude oil price dynamics: Applications of ARIMA-GARCH models. *Energy Economics*, 32(5), 1001-1008.

Narayan, P. K., & Narayan, S. (2010). Modelling the impact of oil prices on Vietnam's stock prices. *Applied Energy*, 87(1), 356-361.

Noor, M. H., & Dutta, A. (2017). On the relationship between oil and equity markets: evidence from South Asia. *International Journal of Managerial Finance*, 14(5), 370-388.

Oberndorfer, U. (2008). Returns and volatility of Eurozone energy stocks. *ZEW-Centre for European Economic Research Discussion Paper*, 4(3), 8-17.

Papapetrou, E. (2001). Oil price shocks, stock market, economic activity and employment in Greece. *Energy Economics*, 23(5), 511-532.

Park, J., & Ratti, R. A. (2008). Oil price shocks and stock markets in the US and 13 European countries. *Energy Economics*, 30(5), 2587-2608.

Pollet, J. M. (2005). Predicting asset returns with expected oil price changes. Available at *SSRN*, 6(3), 72-82.

Reboredo, J. C. (2015). Is there dependence and systemic risk between oil and renewable energy stock prices? *Energy Economics*, 48(1), 32-45.

Reilly, F. K., & Brown, K. C. (2011). Investment analysis and portfolio management: *Cengage Learning*, 5(2), 225-238.

Rua, A., & Nunes, L. C. (2009). International comovement of stock market returns: A wavelet analysis. *Journal of Empirical Finance*, 16(4), 632-639.

Sachs, J. D., Cooper, R. N., & Fischer, S. (1981). The current account and macroeconomic adjustment in the 1970s. *Brookings Papers on Economic Activity*, 1981(1), 201-282.

Sadorsky, P. (1999). Oil price shocks and stock market activity. *Energy Economics*, 21(5), 449-469.

Sadorsky, P. (2012). Correlations and volatility spillovers between oil prices and the stock prices of clean energy and technology companies. *Energy Economics*, 34(1), 248-255.

Samuelson, P. A. (2016). Proof that properly anticipated prices fluctuate randomly The world scientific handbook of futures markets: *World Scientific*, 4(1), 25-38.

Soytas, U., & Oran, A. (2011). Volatility spillover from world oil spot markets to aggregate and electricity stock index returns in Turkey. *Applied Energy*, 88(1), 354-360.

Sun, E. W., & Meinl, T. (2012). A new wavelet-based denoising algorithm for high-frequency financial data mining. *European Journal of Operational Research*, 217(3), 589-599.

Wen, X., Guo, Y., Wei, Y., & Huang, D. (2014). How do the stock prices of new energy and fossil fuel companies correlate? Evidence from China. *Energy Economics*, 41(1), 63-75.

Williams, J. B. (1938). The theory of investment value, 21(4), 54-66.

Yurtsever, C., & Zahor, T. (2007). Oil price shocks and stock market in the Netherlands. *Working Paper Series. University of Groningen*, 18(5), 54-61.

Zarour, B. A. (2006). Wild oil prices, but brave stock markets! The case of GCC stock markets. *Operational Research*, 6(2), 145-162.

Zhang, Y.-J., & Wei, Y.-M. (2010). The crude oil market and the gold market: Evidence for cointegration, causality and price discovery. *Resources Policy*, 35(3), 168-177.