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Oil Price and Oil Price Shock Volatility Spillover, Time-Varying and Asymmetric Effect on Equity Return: Evidence from Asian Market

by

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I would like to dedicate this achievement to my beloved parents and siblings who are the pillars of my strength

CERTIFICATE OF APPROVAL

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Abstract

This study explores the long term and short term oil price connection with equity return of Asian market. VAR model is employed to investigate the long run relationship. The results provide the empirical evidence of presence of long run connection of oil price with equity return. However, the results indicate the absence of short run relationship. In this study ARMA-GARCH model is employed to examine the transformation of oil market mean and volatility spillover to Asian equity market. The study finds no evidence of transmission of mean spillover from oil market to equity market of India, Indonesia, Japan, Sri Lanka, Philippine and Saudi Arabia. The study finds the transmission of oil markets volatility spillover to equity market of Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Sri Lanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan. DCC-GARCH model is applied to explore the time varying relationship of oil price with equity return. This study finds no dynamic conditional correlation in India, Israel, Japan and Sri Lanka equity markets. The time-varying correlation exists in Australia, China, Korea, Malaysia, Saudi Arabia, Singapore and Taiwan and finds no time-varying relationship in Indonesia, New Zealand, Pakistan, Sri Lanka and Philippine. To explore the oil price asymmetric impact on equity return, the NARDL model is employed. NARDL model identifies the asymmetric impact of positive oil price shocks and negative oil price shocks on equity return of Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Sri Lanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan markets. Furthermore, impact of oil price on equity returns is not different in oil importing and oil exporting countries. This study has important policy implication for policy makers and investors.

Keywords: Oil Price, Oil Price Shocks, VAR, ARMA-GARCH, DCC-GARCH, NARDL, Equity Returns.

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Abbreviations

ADF	Augmented Dickey-Fuller
ARMA-GARCH	GARCH in Mean
DCC-GARCH	Dynamic Conditional Correlation
E-GARCH	Exponential GARCH
GARCH	Generalized Auto-regressive Conditional Heteroskedasticity
GJR-GARCH	Glosten Jagannathan Runkle
JJ Approach	Johansen & Jesilus Approach
NARDL	Non-Linear Auto-regressive Distributed Lags
PP Test	Phillips-Perron Test
TARCH	Threshold Auto-regressive Conditional Heteroskedasticity
VAR	Vector Auto-regressive Model
WTI$^+$	Positive Oil Price Shock
WTI$^-$	Negative Oil Price Shock

Chapter 1

Introduction

1.1 Background of the Study

Oil is the vital input of an economy. Oil price variations causes uncertainty in development and prosperity of economy. Vo (2011) argues that increment in oil price results in higher production cost that influence inflation rate and purchasing power which affects the financial activities. Oil price is the major gauge of economic growth, volatility in its price has the significant effect on equity. Ciner (2013) for instance, argues that the connection of oil price with equity return define into two ways. First, oil price shock results in fluctuations in expected cash flows and therefore influence the economy. Secondly, oil price shock affects the discount rate which is used for equity valuation results in inflation. Moreover, oil price shocks transmission to equity market leads instant instability in financial and economic activities. However, the extensive literature discussing about the connection of oil with equity market is available but there are very few studies available on oil price impact on equity return (Bouri, 2015).

Oil is viewed as the world's predominant input, and its worldwide market is the most essential element of the energy markets. Oil prices have demonstrated extraordinary fluctuations in last decade due to monetary and geological elements.

The oil price variations greatly influence the economic activities, inflation, corporate profit, and other monetary factors because of its broad use as a vital contribution to the manufacturing area. The gigantic oil price impact on specific economies, have invigorated studies to explore the variations in oil price impact on economic activities. Researchers may have turned out to be explicitly keen on exploring the oil price fluctuations impact on equity return after most recent global financial crise (Bouri et al., 2016).

Oil prices appear to influence equity returns, at any rate under specific circumstances. In the first place, oil is a major input of current financial movement. Secondly, there is market recognition that due to oil price variations, equity market returns always get affected. Increase in oil prices may influence the worldwide economies by various mechanisms, which incorporate exchange of revenues from oil importer country to oil exporter country. Increase in oil prices results in increase in inflation due to increment in manufacturing cost which influence the consumer behavior and at the end affects the equity returns in an economy (El-Sharif et al., 2005).

According to Noor and Dutta (2017), Oil is a vital and significant product for the global economy. Thus, the financial activities may get affected by the oil price variations. Oil becomes a vital macroeconomic variable due to so much variation in its price and as a result it causes financial and economic distress. Oil price fluctuation has crucial significance in the economies of importers and exporters of oil products. The economies included in GCC have the huge reserves of oil that's why they are the biggest exporters of oil in the globe.

Fluctuating oil price in recent years have made reestablished effect for the connections among oil costs, financial and economic activities. Oil price fluctuations significantly affect the monetary and fiscal policy. The empirical evidence provides by the previous literature on the connection of oil price with equity return in oil exporters during economic crisis. As opposed to direct models that expect stationarity, routine models depend on a mix of parametric appropriations whose probabilities rely upon secret state factors (Cifarelli and Paladino, 2010).

Latest studies do not just concentrate on looking at oil price adjustment effects yet in addition the oil price fluctuations impacts. Non-linearities of oil price consequences for equity returns have additionally pulled in the consideration of an ever increasing number of analysts. It ought to be noticed that oil value impact consequences vary from economy to economy, contingent upon a few variables for example, the economy's oil importer or oil exporter circumstance (Arouri and Rault, 2012).

However, it varies due to the position of oil either it is input or the output in an economy. Besides, a few enterprises may be in a situation to charge higher oil prices to their clients, therefore eliminating the fact that oil price increment negatively affect their earnings. The level of fluctuations in oil prices decides the competition level among the firms or industries. is probably going to have significant relation on this 'go through' impact. Likewise, increase in oil prices may indirectly affects the economy, for instance, fiscal policy, consumer behavior and business. Moreover, oil products and its substitutes have an incomprehensibly unpredictable cluster of results. Different substitutes and alternatives can be used in place of oil. Numerous examples show that there is no oil alternative e.g. aeronautics oil. The negative consequences of oil price on financial activities of an economy and oil as a vital product for some companies, it may anticipate a negative effect on the greater part of the businesses (Ahmad et al., 2017).

Extant of empirical studies are conducted on linkage of oil price with financial equity markets. Oil prices appear to influence equity returns, at any rate under specific circumstances. In the first place, oil is a major input of current financial movement, secondly, there is a market recognition that equity return respond to oil price variation. Higher oil price may influence the worldwide financial activities through various mechanisms, which incorporate exchange of oil importers income to oil exporters. Increase in oil prices results in rise in inflation due to increment in manufacturing cost which molds the consumer behavior and at the end affects the equity returns in an economy (Guidi et al., 2006).

The connection among oil price and equity return seems to be very normal. According to Huang et al. (1996) oil assumes a vital role in an economy, however, it anticipate that oil price shocks are related to fluctuation in equity price. Increment in prices has a crucial significance in asset pricing and stock return. Whereas asset pricing involves the discounted cash flows of firms and it is included in equity returns without any delay. The thought of whether and to what degree there are asymmetry impacts identified with oil costs and stock returns has had little presentation in the previous studies.

On the fundamental level, it does not provide any evidence that how variations in oil prices affects the aggregate equity returns however it is the mixture of stocks gain or loss. For instance, it presumes that oil price increment negatively influence equity return of energy sector. Oil price shock demonstrate measurably no huge effect on chinas equity return, excluding the energy sector (Cong et al., 2008). As opposed to these outcomes, Chen (2010) utilizes time-varying approach to demonstrate that increments in oil costs results in higher margins. In Saudi Arabia increments in oil prices positively affect equity returns (Arouri and Rault, 2012).

1.2 Gap Analysis

Because of the crucial significance of oil in economic factors feasible improvement and financial markets, fluctuations in oil prices have been examined by various studies. Adjustments in the oil prices are frequently viewed as a critical variable to understand changes in returns of stock. Financial analysts have not agreed yet about the relationship of oil price with equity returns. Oil price rise is related with fall in stock market prices According to Huang et al. (1996) oil price shocks are negatively related with the equity returns. In future, study can be conducted to examine the transformation of volatility spillover from oil price to equity return and currency market (Soyemi et al., 2017). The connection of equity with oil volatilities in the financial crisis period is not studied yet (Noor and Dutta, 2017). Future research can be done by taking into account these three objectives (a) all shocks are not alike. (b) There is time varying relationship of oil prices with equity return. (c) the relationship of oil price shocks with equity return varies across markets (Smyth and Narayan, 2018).

1.3 Problem Statement

Over the past years, so much fluctuation in oil prices has been seen. Before 2014, the cost of oil was above $100, yet in the mid of 2014 oil prices started decreasing. Oil prices decreased from above $100 barrel to $50 barrel. From 1973 to 2008, the contribution of oil price shocks to economic growth and equity returns ranges 5 to 12%, which rises to 22% in year 2009 and remained higher up to 17% from 2009 to 2012. Previous studies show the presence of long run connection of oil price with equity returns. However, not so much studies done in context of short term connection of oil prices with equity market return, so it needs to discuss. Past studies focused on spillover from oil price to equity returns. The volatility and mean spillover from oil price to equity returns needs to be study. There is an asymmetric connection of oil prices with equity return, whereas past empirical results show the symmetric connection of oil prices with equity return which needs to investigate. The connection of oil prices with equity market return is not constant. Therefore, the time varying relation exists among oil prices and equity return, which needs to be examined. The connection of oil prices with equity market return varies from oil importer countries to oil exporter countries. Hence, previous literature only focuses on oil exporter countries or oil importer countries. However, there is a need to study the difference of connection of oil price with equity returns in oil importer and oil exporter.

1.4 Research Questions

As per the study, there are some questions which have to be answered:

- What is the connection of oil price with equity return of Asian market?
- What is the oil price shock impact on equity return of Asian market?
- What is the volatility and mean spillover from oil prices to equity return of Asian markets?

- Is the connection of oil price with equity return asymmetric in Asian markets?

- Is the connection of oil prices with equity return time-varying in Asian markets?

- Is the connection of oil price with equity return different in markets of oil importers and oil exporters?

1.5 Research Objectives for This Study

As per the study, there are some objectives which have to be fulfilled:

- To investigate the Long term connection of oil price with equity return of Asian markets.

- To explore the short run connection of oil price with equity return of Asian markets.

- To explore volatility and mean spillover from oil price to equity return of Asian markets.

- To investigate the oil price asymmetric connection with equity return in Asian market.

- To explore the time-varying relationship of oil price with equity return in Asian markets.

- To study the difference of oil prices connection with equity return of oil importer and oil exporter countries.

1.6 Significance of The Study

Over the period of time so much variations in oil prices has been observed. Previous literature shows blur picture of connection among these variations in oil price and equity return. Throughout the recent couple of decades, number of studies has explored the linkage of oil price with stock return. It is prominent that greater segment of these studies inspect the aforementioned relationship principally on the equity returns and not many investigations have focused at equity market return. This study provides new insight on the relationship of oil price with equity market returns. Historically the relationship of oil prices with equity market returns is not symmetric. Increase or decrease in prices of oil has different influence on equity market return. Previously no empirical evidence is available on asymmetric relationship of oil prices with equity market returns. Hence, this study investigates an asymmetric relationship of oil prices with equity returns. Over the period of time, the relationship of oil prices with equity market return strengthens or weakens. In this study, time-varying relationship of oil prices with equity markets return is emphasized. The linkage of oil prices with equity market return of oil importer and oil exporting countries is not alike. This difference of relationship of oil prices with equity market returns has been focused in the study. This study helps the policy makers and investors in accurate prediction of oil market to adjust their holdings in equity market. This study also helps the policy makers and investors to observe the fluctuations in oil price to forecast the transformation of oil market volatility to equity market and also oil price asymmetric effects so that it may not adversely affect the equity return.

1.7 Plan of The Study

This study is comprised of five chapters. First chapter as discussed earlier is about introduction. The second chapter includes Literature review. The third chapter provides the information about Data Description. Fourth chapter discusses about the results. Fifth chapter encompass the policy implication, future research direction and conclusion.

Chapter 2

Literature Review

In this study, literature review is classified into six sections. First section discusses about the oil price connection with equity return in long term and short run. Second section discusses about the spillover of oil markets to equity markets. Third section discusses about the oil prices impact on equity market return. Fourth section discusses about the asymmetric connection of shocks in oil price with equity markets return. Fifth section discusses about the oil price time-varying relationship with equity market return. Sixth section discusses about the difference of relationship of oil price shock with equity returns in oil importer and oil exporter countries.

2.1 Oil Price and Equity Return

Variations in stock market prices are usually connected to forthcoming financial news. In the ongoing past the interest rate has been a typical term in the day by day news, as it should impact the economy and as well as the equity market prices. Be that as it may, the level of interest rate, as well as the price of oil factor, state of inflation and components of different categories are said to impact the economy and stock market prices (Chen et al., 1986).

While discussing about the role of oil prices in an economy emphasize the oil price shock significance (Huang et al., 1996). As it contends that by influencing economic development, income level, expansion and finance related strategies, an increment in prices of oil place vital impact on asset pricing and stock market. Summarizing the whole research considering the oil price and financial market,**'Perfect market assumes to have a high productivity of firms, so the variations in oil prices impact on the equity return is an important and helpful proportion of their financial effect'** . Whereas asset pricing involves the discounted cash flows of firms and it is included in equity returns without any delay. The thought of whether and to what degree asymmetric impacts identified with oil costs and equity return had little presentation in previous studies (Jones et al., 2004).

In last decade, the connection between oil costs and equity returns has enchant a huge consideration. Distinctive strategies and methodologies utilized in different examinations, however it is commonly concurred in the studies that global oil price has noteworthy and negative effect on equity return (Sadorsky, 1999). Oil prices effect on stock returns transfer into following ways: If the oil prices increase, then equity returns of the companies decreases which uses it as an input due to rise in cost of production and they are supposed to not transfer this cost to their clients. In this manner, the oil price shocks may definitely have negative relationship with equity return.

The other scenerio is that high oil price causes inflation which may reduce the equity returns and it shows the negative oil price connection with equity returns. This situation pushes the national bank to increase interest rates and as a result it influences the equity returns. Previously the researches on connection of oil prices with equity return were conducted on emerging markets. Previous literature shows that major part of the researches on connection of oil price with equity return were conducted on emerging markets. However, the worldwide capital markets played a vital role that developing markets are playing on the globe. Now the researchers of developing nations have started focusing on the linkage of oil price with equity return of developing countries. The empirical evidence of connection of oil price with equity return and suggests the robust connection of oil price shock with equity market return in developing markets. The study pursues this bearing of research also, focuses especially on one of the greatest rising equity market of China (Basher and Sadorsky, 2006).

In spite of the way that China has outperformed Japan and became the world's largest oil importer. China has kept up a tenacious rapid of economic development in the course of the last two-three decades. This fast development and its related emotional vitality request have significantly affected the world vitality and monetary markets and have pulled in a generous measure of global consideration. However, the expanded energy market reliance joined to China's development causes the probability that the China monetary market is progressively defenseless to worldwide equity market price. Li et al. (2012) indicates that China is currently a functioning member in global oil price, demonstrating oil cost in China is measurably keeping up a prolong association with real world WTI costs.

Specifically, Granger causality model propose solid bi-directional connections, and in this manner suggest that in China factors of global oil prices influence financial execution. As vector auto regressive model applied by (Cong et al., 2008) to explore this issue yet discovered no measurably noteworthy effect of oil price on equity return in china equity market. However, by employing variance decomposition model and impulse response model they find that oil price fluctuations may affect the equity returns in China. A conceivable purpose behind this proposed is that oil price variations results in volatility in stock market (Cong et al., 2008). Seeing in which manner global oil costs may affect oil firms is an intriguing inquiry and can additionally be reached out to overall energy sector. In accordance with the quick development of energy and gas sector, the size of energy companies in China has extended fundamentally also in the most recent decades. Notwithstanding a composite energy firms indices, three subindices are additionally constructed i.e. oil and petroleum gas, coal, power and electricity.

Fama (1990) asserted that it is just an intermediary impact for an increasingly essential connection between forecasted equity returns and oil prices. Geske and Roll (1983) contended how inflation occurs due to variations in equity returns.

Kaul and Seyhun (1990) anticipate the proof that the oil price shock results in negative relation of oil prices with equity return. The after effect of that time varying analysis is duplicated inside the APT system by Chen et al. (1986) and James et al. (1985) uses the vector auto-regressive (VAR) model. Lee (1992) finds a negative oil price connection with equity returns by taking into consideration the interest rate which influences the inflation and also finds a negative linkage among inflation and interest rates, reacts adversely to shocks in interest rates. Balduzzi (1995) applied VAR and the inferred moving midpoints to test the intermediary speculation by Fama (1981). Moreover, conducts correlation analysis to find the quality of the connection among equity prices and inflation rate and finds that relation among equity prices and inflation forms through interest rates. However, the interest rate represents a noteworthy negative connection of oil prices with equity returns.

Fama (1981) and Lee (1992) find a positive relation of shocks in oil price with equity returns. However, the connection among equity returns and interest rates is not justified yet. The negative connection of oil prices with equity return demonstrated by (Chen et al., 1986). Lee (1992) finds that the oil price impact on equity return in not noteworthy. Various studies in U.S are grounded on the Chen et al. (1986) study about the oil price connection with equity returns. As Hamao (1988) find a strong relation of oil prices with equity return while examining the Japanese stock. Martınez et al. (2005) conduct the study on Spanish stock and find no noteworthy estimating connection between equity returns and macroeconomic factors. Blair et al. (2001) are additionally unfit to clarify the relation among oil prices and equity returns by the variables utilized by Chen et al. (1986). Moreover, Kaneko and Lee (1995) revisited the previous studies on Japanese and U.S stocks. They utilized the Chen et al. (1986) components to assess the impacts of systematic risk on oil prices over equity returns. Utilizing a VAR framework, they discover that U.S stock analysis include both interest rates and inflation rate. In Japan, in any case, worldwide factors had turned out to be progressively critical. Other than the findings of Hamao (1988), in Japan, variation in oil prices occurs due to inflation.

The reaction of equity returns due to shock in oil price invstigated by (Jones and Kaul, 1996). They inferred that equity markets of U.S.A and Canada are sound, in the context that the discounted and forecasted cash flows represent the variations in oil prices. Equity markets in japan overreact in response to variations in oil prices. The outcomes from the investigations above propose that huge macroeconomic components for the equity returns, however these factors are not actually obvious in European stock markets. The study broadens insight about this fact in two aspects. Firstly, there is casual relation of oil price with equity return especially in those countries where stock markets are less developed when contrasted with those in U.S.A, U.K and Japan. They explore more extensive markets prevails in Norwegian stock market, in this manner expanding the worthiness of such studies. At the point when the inverse is valid, we clarify how this can be represented by particularities in the Norwegian economy. Secondly, VAR model is used to set up the dynamic connection between the factors. This study implies variance decomposition and uses impulse response model to address the issue of quick response of other variable due to changes in one variable.

Sadorsky (1999) uses an unrestricted vector auto regression framework and find the connection of oil prices volatility with equity market return and financial activities. Sadorsky (1999) concentrated on American economy and examined the period 1947 to 1996. The outcomes confirm that the prices of oil and the oil price volatility assume a vital role in influencing the financial activities. The outcomes likewise uncover that adjustments in oil prices influence the financial actions despite the fact that adjustments in the financial activities have little effect on oil costs. The fluctuations in impulse response demonstrate that oil value developments are essential in clarifying developments in the stock returns. Positive shocks in prices of oil discourage stock market profits whereas stock market returns shock has positive effect over rate of interest. Hence, there is the proof of symmetric effect of oil price volatility on economy.

In the studies, global oil markets have received a critical consideration. Adelman (1984) depicted the global oil market as 'one incredible pool', proposing that prices of oil from various locales are connected. Hypothetical suggestion for worldwide analysis is given by arbitrage theory, which propose that expansive differences in oil price ought not to be shown up. Or maybe, oil prices with comparable affects may progress firmly altogether, to the extent that value differences are pretty much consistent. Over the years, the oil prices spread pursued such an example that the oil price variation occur within a specified range. In late 2010, there has been a critical expansion of that differential, which affects co-integration among the markets. An option to 'worldwide pool' speculation is that oil markets are 'regionalized', and in this way respond to oil market shocks and impacts. These refinements have imperative ramifications in energy markets, production costs for energy sector and in addition hedging policies. In previous studies Hubbard and Weiner (1991) employ correlation and regression analysis over the oil market. The outcomes propose that the oil market is profoundly regionalized, yet the linkage debilitate when analyzed crosswise over the regions.

According to Milonas and Henker (2001) Brent and West Texas Intermediate (WTI) markets are not completely co-integrated. As it contends that regionalization may enhance the efficiency of market, price differentiation among markets that would enhance arbitrage strategy. Such exchange would hold on until value differentials had been adequately lessened, while taking into consideration transportation expenses and contrasts in quality (sulfur content, API gravity record). Moreover, co-integration techniques utilized for the investigation of oil prices co-movement in various markets. However, hypothesis of globalization is dependent on utilization of these techniques. As discover proof among bivariate spreads (value differential) in few benchmarks of a long-run connection (Soytas et al., 2009). To show the presence of a long-run connection others applied causality tests (Silvapulle and Moosa, 1999).

Numerous studies conducted on influence of WTI oil prices on financial sector, moderately few studies available on linkage of fluctuations in oil price with equity market return, as described by (Basher and Sadorsky, 2006). Moreover, a large portion of these researches concentrated on developed countries, like US, Canada, Europe, and Japan (Jones and Kaul, 1996). These studies show uncertain consequences. However, few papers concentrated on European, Asian and Latin

America developing markets. The results of these studies demonstrate that relationship of fluctuations in oil prices with these developing nations stock returns is short term in nature. For example, utilizing a VAR demonstrate, Papapetrou (2001) demonstrates that in Greece there is an important linkage of fluctuations in oil prices with equity market return. By utilizing a worldwide multifaceted model and achieve a similar end for other rising equity markets (Basher and Sadorsky, 2006). In spite of the way that oil related studies in mid of 80's shows the connection among oil prices and equity market has achieve a remarkable increment in consideration by analysts just in the course of the last two decades. The picture showed by these scholars for a negative connection of oil price fluctuations with equity market execution.

The entire relation on the oil price impact on financial sector and economic factors can't be delineated, until or except there is split of the oil price shock. The researchers are the pioneers who recognize supply and demand factors in oil price shock, contending that economic factors and money related markets may diversify through these oil price shocks. Hence Kilian (2009) unravels the shocks in oil price in context of demand into total demand shock and prudent demand shock (oil-advertise particular demand shock) with the end goal to achieve the shock in oil price that start with the expansion in economys total interest and expanded interest because of sensitivity about the future accessibility of oil, separately. Previous studies inspected the impacts of worldwide, nation and industry factors on development what's more, volatility of stock returns yet not emphasize on local and country specific economic effect.

Becker et al. (1999) examine that worldwide components and economic variables are significant in clarifying the stock's return movement along with the oil prices whereas financial elements are seem to be more significant than economic factors in fluctuations in equity market returns. In addition,to explain the equity market volatility economic variables are crucially more significant. According to Kang and Ratti (2014) relating to the promptly accessible data, a positive relationship has been set up among total oil price demand shocks and monetary or financial equity market advancements, though a negative linkage holds amid oil market particular oil price demand shocks. Now it is significant that vast range of literature molding around the idea that oil price supply shocks don't practice any longer impact on either the economy or the money related markets . Oil price supply shocks practice a more constant impact on equity return of France, Germany, Japan, the UK and the U.S.A. (Li et al., 2014).

Extent of studies have conducted broad investigation on oil prices impact on macroeconomic factors. Empirical researches on the connection among energy equity price and economy mainly depend upon the linkage of oil price shocks with equity return. Oil price volatility and shocks has a prominent role while identifying the oil price movement as compared to interest rates of the forecasted variance in context of U.S equity return. Papapetrou (2001) study the stock market of Greece and find that in defining movements in equity price, fluctuations in oil price plays a crucial part and identifies that positive shocks in oil price restrain equity return. Ciner (2001) identifies the asymmetric oil price connection with real equity return.

Volatility in oil price causes a major fluctuation in the equity returns and activities of the economy (Ewing and Thompson, 2007). If oil prices affects real GNP, so it shows that for the companies whose direct and indirect costs are oil prices, their earnings will get affected. Hence, higher oil price results in expected earnings depletion, and therefore stock price also decreases if the cash flow capitalizes by stock market due to oil price increment. However, due to inefficient stock market, lag of adjustment in oil price as a result of fluctuations takes place. Jones and Kaul (1996) states that oil price movements definitely affect equity return of U.S. In this study, they explore a significant relationship of oil price with equity return, in which they include lagged effect, from the period of 1947 to 1991. This study has focused on macroeconomic factors by using the quarterly data and the product price index of fuels employed as oil price index proxy. Whereas in another research to explore the relationship of international equity return with oil shock they employ quarterly data which can be requisite by cash flows spot and future changes and fluctuations in expected return of equity. CAPM model employed to explore the connection of oil price with equity return of Canada and U.S.A stock and it can only be measured by shocks impact on the cash flows.

Sadorsky (1999) studies the connection among oil price volatility, equity returns and macro-economic factors by applying VAR model. Generally, it is supposed that macro-economic factors affected by oil price variations. In south Asian markets inflation causes due to increment in oil price (Cunado and De Gracia, 2005). In Mexico, as a result of oil price increment consumer and investor behavior changes due to oil price increment (Uri and Boyd, 1997). According to Sachs et al. (1981) Oil is the most important input for production. Production cost increases due to higher oil prices automatically transfers industries to low energy exhaustive industries. This, in result influence the production level and also raises the unemployment level in Mexico. In fact the increase in oil price influences different sectors in different ways. Moreover, the influence of increase in oil prices on consumption, GDP, import, investments and export e.t.c. studied by (Jiao et al., 2007).

Globally, Crude oil significantly influence every country in production and consumption sectors. Change in oil prices has crucial significance in the economies. Sudden oil price fluctuations and uncertainty explains the oil price shocks more effectively, which positively or negatively influence the economy. During 1970's economic recession in U.S., accredited to this circumstance that production level decreases due to increase in oil prices. Likewise, Kilian and Murphy (2014) suggests that fluctuations in monetary policy, changes in labor market situation, and fluctuations in energy sector causes due to oil price volatilities pertaining the fact that oil price fluctuations has connection with the global economies macro-economic factors.

Sadorsky (2001) finds that Canadian equity return are positively influence by the increment in oil prices. According to impulse response model, Papapetrou (2001) demonstrates that fluctuations in oil price has significant importance while measuring the equity market returns and find that positive movement in oil price shock causes decrease in equity returns. Hammoudeh and Li (2005) finds that in U.S investors and transportation firms decide the oil prices as it depends on their demands. In Norway and Mexico, the same results implies on their equity markets return. Whereas in UK, oil price shocks have positive influence on equity returns of energy sector. Hence, results proof that inverse implies in non-oil related sectors. Multivariate framework has been employed to examine the factors that may affect energy sectors equity return. The consequences depict the oil prices positive impact on equity returns (Boyer and Filion, 2007).

In last twenty years, Australia has become independent in oil based goods. In spite of this reality, Australia is occupied with import and export of oil based goods. However, in the mid of 1980's Australia was the oil importing country, though in the mid of 1990's, Australia has become an oil exporting country. Hence, the oil exports of Australia were 2% less than its import. As in accordance with the Australia's huge geographic area, moderately little and differing society, the expenses of transportation and cargo conceivably comprise a noteworthy segment of the expenses of numerous Australian organizations, and the cost of oil is likely to affect these expenses. Then again, some Australian enterprises earn extensive income from oil and oil-related items and thus oil price variations will influence the revenues of these businesses. It is hard to plan anticipated signs and relative sizes crosswise over explicit businesses of oil variable sensitivity.

Chen et al. (1986) contends that positive shock in oil price does not extraordinarily influence equity returns. Nonetheless, Ciner (2001) challenges the results of Huang et al. (1996) and contends for further research to create proof from global stock markets to support the vigorous results. Moreover give the proof of a negative connection of oil price shock with equity market return. Different researches examine the systematic oil price shock connection with equity market return. Results detailed in the previously mentioned studies recommends that increment in oil prices due to negative news has impact on economic growth, whereas it affects differently the equity market return due to numerous factors.

One exceptional case is the recent study by Guidi et al. (2006), which inspects the effect of OPEC choices with regards to UK and US equity markets. Curiously, they examine a non-linearity identified with crisis versus non-crisis era. In particular, they identify the late response of OPEC in non-crisis era as compared to crisis era. Fluctuations in equity returns have significant impact on an economy. In specific, the components that affect the stock returns of organizations as well as portfolios is of most extreme pertinence and significance to the investors in the economy. Previous studies focused on stock return however they have no empirical evidence about which element or factor that affects the equity returns. Moreover, there are just a predetermined numerous studies incurred to explore the oil price connection in deciding return of equity. Moreover, these examinations are in the perspective of countries and none of them gives a worldwide point of view.

Hamilton (1996) reports an oil price vigorous impact on U.S.A equity return during the era of positive oil price shock. In U.S.A, oil price shocks have negative influence on equity returns, whereas finds oil price negative influence on equity return by differentiating impacts crosswise over the developed countries affirm by (Mork, 1989). By employing quarterly data of after war finds that the forecasted cash flows determine the relationship of oil price shocks with equity return (Jones and Kaul, 1996).

Oil price shocks affects the economy (Amano and Van Norden, 1998). Chen and Chen (2007) applied a monthly data to examine that expected cash inflows affects the oil price shocks of G7 countries. Bénassy-Quéré et al. (2007) applied VECM model to measure the oil prices co-integration with equity returns and the results indicate that oil price fluctuations are higher than the foreign exchange in europe and in Granger causality foreign exchange rate led by oil prices. By using oil price and foreign exchange rate finds that foreign exchange led by the oil price increment in European countries and results in devaluation of equity return in oil importing countries. However, these examinations demonstrate that oil price variations influence the cost of production which in result has impact on foreign exchange rate (Lizardo and Mollick, 2010).

Kilian and Hicks (2013) uses VAR approach and recommends that relationship of oil prices with equity return. Whereas it identifies oil price shocks irrelevance to the international equity markets. However, find that oil price positively influences the UK's energy sector. Moreover, applied multivariate models and find out the negative relation of oil price with return in developing countries. Furthermore, a few European nations concentrates that variations in oil prices affects the economic variables (Park and Ratti, 2008).

Cifarelli and Paladino (2010) use GARCH models and find oil price shocks negative impact on equity return. In that period, the normal oil profits are greater than on equity returns, with essentially more noteworthy standard deviations too. Arouri et al. (2011) uses the GARCH models and presume that sectors in an economy are not similarly oil reliant in Europe. Exceptional studies on equity return require that equities fluctuate day by day because of numerous financial activities. Instances of this methodology incorporate Hammoudeh et al. (2004) and Bachmeier (2008) uses daily data to demonstrate that oil price fluctuations have an influence on the equity returns of U.S, yet in a very lower potential.

Bollerslev et al. (2009) embrace a balance econometric model to infer volatility as an average of two factors: firstly is the higher risk and return and secondly is a real premium for higher risk. It provides the evidence that equity market returns can be evaluated through variations in risk premium and forecasted risk. The oil price has direct and indirect effect on stock returns (Broadstock and Filis, 2014). Hamilton (1996) finds that relationship of oil price with financial market can only be examined through oil price movement and stock return. Bopp and Sitzer (1987) finds that future prices can be forecasted through current oil price, even though the inventory levels and other important variables can also be used to forecast through oil past price behavior. In fact, critical oil price coefficients on returns in the companys inferred unpredictability, day by day changes in oil prices and the retained earnings. However, increment in oil price results in fall of equity return and previous studies assumes a long term connection of oil price with equity return.

2.2 Spillover from Oil Market to Equity Market

The connection among oil markets, oil price shock and equity market return has turned into a huge issue. Globalization has assumed a critical significance in studies related to equity market return, its volatility and spillover from one market to another. Sadorsky (2001) analyzes Canadian oil and gas ventures in context of oil prices and interest rate effects on equity market and finds that they significantly affect the equity market returns. El-Sharif et al. (2005) additionally investigate that in U.K fluctuations in oil prices has vital connection with equity returns of energy market and get a comparable induction as Sadorsky (2001). Unfavorable oil prices shock impact on worldwide industries examined by (Nandha and Faff, 2008) and discover the oil price increment negative connection with equity market return for every sector except energy ventures. Arouri and Rault (2012) finds critical volatility and mean spillover of oil market to equity returns in European markets.

The (mean and volatility spillover) co-movement relationship of fluctuations in oil prices with changes in exchange rate investigated by (Indjehagopian et al., 2000) and (Chen and Chen, 2007). There is co-integration exists among WTI prices and U.S exchange rate and a steady connection exists between U.S exchange rate and oil price shock (Amano and Van Norden, 1998). Previous studies show that there has been significant volatility spillover of oil prices to equity returns in US equity markets. The connection of oil price with equity returns has significant volatility in financial markets. The price responses of OPEC countries of at the oil prices arrangement to understand the effect of movements in the US dollar exchange rate over price of different members inspected by (LeBlanc and Chinn, 2004).

According to Miller and Upton (1985), there is oil price positive impact on equity market returns, despite of the fact that empirical evidence of this linkage among oil prices with equity returns has crucial importance. Bollerslev and Zhou (2006) indulge a great effort in finding oil prices mean and volatility spillover to equity return and examine the relationship by employing various techniques for estimating volatility in oil price. The proportions of unpredictability utilized in observational examination of the connections between stock return. Therefore, volatility spillover have included conditional correlation, in light of utilizing high recurrence information to figure out proportions of unpredictability at a lower recurrence, conditional correlation, recuperated from a stochastic volatility spillover.

Notwithstanding government strategies supporting new energy enterprise's growth, new energy equity market index of China has additionally received wide consideration. As indicated by Wen et al. (2014), China's equity market considered as an impression of government policies. Therefore, people are keen to make investment into new energy equities as new energy stocks are probably going to get more fulfilling returns than other comparative stocks. With the end goal to acquire better investment opportunities and lessen finance related risks, assessing relationship of volatility and correlation among new energy stock prices and other prices in index market is pivotal. Moreover in china, oil prices are the crucial factor to impact the equity market, as Broadstock et al. (2012) and Li and Yu (2012) mentioned.

As indicated by Cong et al. (2008), China turns out to be progressively important to the worldwide oil showcase and has a more solid association with the global oil advertise. In particular, utilization of oil in China has continuously expanded, and China has turned into the second-biggest oil customer nation. Additionally, China Consumers Data reports that China has turned into the biggest oil import nation in 2015, because of expanding import reliance. Therefore, since worldwide oil price shock influence oil and significant factors in China, clearly universal oil market is assuming an essential role in China's economic development. As worldwide oil price fluctuations progressively influence Chinese economy and investment in new energy sector is growing, it is pivotal to comprehend impact of crude oil price and new energy equity prices in China market. The study examines the oil prices mean and volatility spillover to energy sector equity returns in China. In addition, volatility relationship and asymmetry between prices of oil and the new energy equity market returns have been moderately studied, particularly the volatility spillover impact of oil prices over new energy sector equity market returns. As the oil market prices and equity market returns employed as translated variable and utilized the autoregressive model to get singular residuals by (Huang et al., 1996). Symmetric and asymmetric connection of oil price fluctuations and financial execution may exist. Therefore, the equivalent is additionally valid for the connection between prices of oil and economic conditions both as far as mean and furthermore as far as volatility spillover.

Olowe (2011) contends that the worldwide economic crisis in 2008 and Asian crisis in 1997 results in oil price instability. Thus, the spillover between oil price fluctuations and economic markets needs further examination. However, that increment of oil prices results in higher inflationary rate, which would prompt the forecast of lower equity returns on investment, this would be considered into while calculating the net present value, with the outcome that a (normal) increment in oil costs may prompt lower equity returns. Hence, disconnecting the causal oil price influence on equity return is crucial issue since there may be numerous components affecting the adjustments in equity return. Increment in oil costs prompt decline in equity returns Japan and china. Different studies demonstrated something else (Jones and Kaul, 1996).

Various researches were conducted to explore the connection of oil price with equity return. Sari et al. (2010) explore that volatility in oil prices influences the S&P500 index. Utilizing European market index data, Arouri et al. (2012) studies the transmission of oil market volatility spillover to equity market. The previous literature indicates that transmission of volatility spillover with the oil price spillover to equity market is vital. However, these studies demonstrate that volatility spillovers among the two markets are insignificant. Hence, these studies can be used for hedging. These results for Europe and the US likewise can be used for emerging market. Elyasiani et al. (2011) uses sectoral data and finds that oil price volatility results in increase in oil users returns. Narayan and Sharma (2014) find the oil price contribution to equity returns in volatility spillover and demonstrate that these results have financial importance for investors. Creti et al. (2014) utilizes latest framework to inspect the dynamic conditional correlation of oil prices with equity returns in oil importers and exporters. The results demonstrate that connection of oil price shocks with equity returns is more grounded in oil importers than in oil exporters.

The GARCH model is applied to find the oil price shock transfer, the dynamic conditional correlation and mean and volatility spillover from one series to another. As compared to other multivariate model it additionally gives significant appraisals of obscure framework with lower calculation complexity i.e. univariate GARCH model (Soytas et al., 2009). This model helps to measure the transfer of shock and volatility from one series to another. To measure the shock transfer from oil prices to equity returns in five noteworthy emerged nations e.g. Japan, Norway, Sweden, United kingdom, and America, Ågren (2006) applied a deviated variant of the multiple GARCH (1,1) framework. The study demonstrates solid proof of oil prices mean and volatility spillover to equity market return with the exception of Sweden market. In any case, which outline the evaluated expected gauge effect of oil price volatility, uncover just little impacts. Malik and Hammoudeh (2007) applied a similar model, take a gander at the transmission of volatility in US equity markets from the worldwide oil market in three middle east markets. The empirical results indicate that middle-east market get shocks from the oil prices, however equity markets mean and volatility just overflow in oil prices in middle east.

Bivariate GARCH models are applied to examine the transmission of mean and volatility spillover of oil prices to American equity market by (Malik et al., 2005). The segments consider corporate financial sector, industrial sector and insurance sector and the experimental outcomes bolster the presence of critical transfer of mean and volatility spillover of oil price to equity markets. Chang et al. (2009) utilize different multivariate GARCH models to measure the volatility spillover of oil prices to different sectors of equity markets. Shockingly, the exact discoveries demonstrate no oil prices volatility spillover to equity market return.

Results of Ewing et al. (2002) study offers as far as it concerns with few fascinating bits of knowledge about the volatility and mean spillover among oil and gas markets. Their outcomes show critical linear and non-linear oil prices volatility spillover transfer to energy sectors return, yet it affects in negative way. As indicated by different researchers, these studies can be ordinarily clarified by contrasts in energy sector's unpredictable and volatile attitude. Sadorsky (1999) employed consolidated VAR model and GARCH deviated frameworks to investigate the movement in oil price shocks with equity market, utilizing the GARCH (1,1) model to get the conditional standard deviation, and VAR model to acquire the dynamic correlation of oil price shock with equity market exercises. Latest literature reports the non-linear impact of oil prices on equity return. Ahmad et al. (2017) investigate the dynamic oil price impact on energy market return, finds dynamic volatility spillover with conditional correlation. Shocks in oil price and economic instability asymmetrically affect equity market, and are profoundly identified with equity market movements.

2.3 Oil Prices and South Asia Equity Market Return

South Asian market is viewed as the biggest consumption market of oil and oil related items. For example, As compared to US, China and Japan, India is the 4th biggest oil importing country of oil and oil related products. Moreover it has 70% imports of oil products, such reliance may go up to 90% because of constrained supply of oil in local manufacturing (Ghosh and Kanjilal, 2016). However, After India, the largest importers of oil and oil related products are Pakistan and Sri Lanka. As Naranpanawa and Bandara (2012), for instance, find that in 2010 Sri Lanka's imports of oil products has expanded upto 39.3% whereas an expansion in consumption on oil and oil related imports was US 2.2 billion to 3 billion dollar. In Pakistan, the oil imports represent 33% of its aggregate imports. Oil is the essential product in South Asian countries, as most of the countries in this region are agricultural and mainly rely on the trade of agricultural products. Hence all the industries, factories and production depend upon oil and oil related products.

In India, Pakistan and Sri Lanka, oil price shock has a crucial significance in their economies. It is in this way imperative to think about the vital linkage of worldwide oil prices with the equity market return of these developing countries. Also, the economy of South Asian countries mostly dependent on agricultural sector that's why it has a reliance on transportation sector which uses the most noteworthy measure of oil and oil related products. Likewise, the metal businesses of the nations are additionally exceeding on oil dependent. Therefore, increase in oil price shocks widely affects the equity returns of these countries stock and highly affects all the sectors of an economy. In this regard, it is essential to understand the linkage of oil prices with equity return to examine the oil prices volatility and mean spillover to equity return in oil importing countries (Bouri, 2015). As the largest oil importing country in South Asian region is India, so the variations in oil price hugely affects its economy and stock returns.

Ghosh and Kanjilal (2016) additionally report that in India, government has to announce subsidy in case of increase in oil prices which causes inflation and decreases investment and at end negatively impact the equity returns of india. Not shockingly, previous studies show the absence of volatility transmission of oil price to equity returns of Indian stock. Naranpanawa and Bandara (2012) find that the largest oil importing country in this region is Srilanka. They find the significant relationship of oil price increment with the economy and equity returns and creates crisis period situation in the economy. The past price shocks in equity market affects the current equity returns of Pakistan stock. As in oil market, the past price shock does not affect the current oil returns. This finding negates with the vast majority of the prior investigations, however past price shocks cant be used to predict the present oil returns.

Hence, in Pakistan stock, past price shocks used to forecast the oil price volatility presence. As oil is the essential input of an economy therefore it causes oil price volatilities crucial influence on equity return, noteworthy variations in worldwide oil prices appear to generously influence the country's economy. For example, in Pakistan the industrial sector is predominantly reliant on oil and in this way increments in oil price causes manufacturing cost expansion which causes lower production and affects the equity returns. As discussed earlier, the past price shock in equity returns does not affect the oil market. However, the connection of oil price with equity is shockingly under-examined. The present study investigates WTI oil prices mean and volatility spillover to the significant South Asian equity market which is not studied yet.

Major portion of the past literature concentrated on the connection of oil prices with aggregate equity return is specific to any country or countries. There are a few aspects behind these blended outcomes, which have to be investigated in detail. Firstly, heterogeneity should be considered while examining the aggregate sock returns and increase or decrease in oil prices. **"No reason exists behind the relationship of oil price affects aggregate equity consistently where**

equity index is a mixture of firms which may results in gain or loss due to oil prices variances" (Kilian and Park, 2009). Secondly, the blended outcomes can be clarified to some extent due to presence of heterogeneity in oil reliance firms and equity returns across countries. A noteworthy fact behind why the larger part of literature concentrates on negative connection of oil price with total equity return as most of the studies have concentrated on the oil importers i.e India, Sri Lanka and vast majority of Asian countries where cash flows are more concentrated. Third, large numbers of the studies before, neglect to think about oil price shock. Fourth, a large portion of these studies neglect to think about the time varying connection of oil price with equity return (Mollick and Assefa, 2013).

Miller and Ratti (2009) examines a negative relationship of oil prices with equity returns that either ends up uncertainty and vanishes out to be less articulated in the new thousand years, perhaps reflecting rises in the market. The revenues of those companies come from oil and oil related products definitely negatively affected by the variations in oil prices. Then again, without balancing impacts, would anticipate an oil return positive affectability with oil and oil-related businesses, where oil straightforwardly influences income side of the profit and loss account. Hence the cost transfers to consumer decide the impact of oil prices with equity returns in industries. Besides this through hedging and derivatives, industries guard themselves from this risk of oil price fluctuations. In Airline industry, they face long term transactions in case of oil and oil related products. Notwithstanding, the degree of which risk appears define the impact of oil prices on stock returns. Besides, given the development in subordinate items and the enhanced comprehension of risk, anticipate derivative application to turned out to be increasingly regular as compared to last decade the affectability to oil price fluctuations will have debilitated after some time. While trying to frame expectations about the indication of the sensitivity of oil price variable, the degree of an "additional market" affectability to oil price changes is an observational issue.

2.4 Oil Price Shocks Asymmetric Effect on the Equity Market Return

Mork (1989) finds the oil price asymmetric relationship linkage with equity return and also on fuel prices. The vast majority of prior researches on the connection of oil price with equity return find that basic factors examined a direct and linear relationship (Zhu et al., 2011). Huang et al. (2005) gives a hypothetical recommendation at oil price asymmetrical influence on equity returns. The study recommends that ideal choice for organization is when expected present value is higher, the company will pay dividend to their investors otherwise not. The oil price ups and downs cause increase in present value and also enables the organization to pay dividend. If increase in oil prices does not rise present value then firm decides not to pay dividend, it may also result in decrease in stock prices. In another case if the oil prices decreases, the company decides to distribute high dividends, which results in increase in stock prices. In another case if the oil prices decreases, the company decides to distribute high dividends, which results in increase in stock prices. Huang et al. (2005) finds that the negative relationship of oil prices with equity return is more prominent than positive relationship of oil prices with the equity prices .There is the probability that due to rise or decrease in oil prices, asymmetric effect may cause indirectly through discount rate to manage interest rates (Salisu and Isah, 2017). The empirical evidence shows the asymmetric relationship of oil prices with equity return. Few studies have discovered larger influence of increase in oil price on oil price return.

Tsai (2015) explores no asymmetric relationship of oil prices with GFC. As Ramos and Veiga (2013) find the asymmetric relationship of oil prices with equity returns in oil importer countries rather than in oil exporting countries. Previous literature fails to provide the evidence on asymmetric relationship of oil prices with aggregate stock returns. According to Tsai (2015) **"The total equity returns may blend the impact of positive shocks in oil price with negative shocks in oil price on particular equity return"**. Previous studies provide evidences on relationship of oil prices with equity return is described by non-linearities, which is reliable with the fact of asymmetric connection of oil prices with equity return. Sadorsky (1999) examined the impacts of increments and diminishes in oil prices results in increments in equity returns. This study recommends that there probably won't be a symmetric relationship or that the oil price fluctuations cause a relationship with the oil price return and economy. A prior case of the connection of oil price shocks with equity returns is energy sector. Ciner (2001) finds the instance of the USA and discovered oil price asymmetric influence on equity return.

According to previous literature it is refers that variations in oil price cause impact on equity market, the connection turned into a conspicuous research field in economics, finance and energy sector (Park and Ratti, 2008). The basic purpose behind employing oil price fluctuations as variable of influencing equity returns is that it archived by fluctuations in oil prices has a basic and a crucial effect on financial transactions, thus oil price fluctuations are probably going to impact the equity returns, where equity markets most significantly affect the financial activities However, oil price variations can affect the expected cash flow of firms, as for an economy oil is known as the vital input. Moreover, an expansion in prices of oil would expand the cost of production, prompting lower dimensions of profits and at the end causes a devaluation in equity returns (Arouri and Nguyen, 2010). Moreover, oil price fluctuations additionally impact the discounting rate which is generally utilized in esteeming value securities. An expansion in prices of crude oil would result in inflation, prompting higher financing costs, which as a result negatively affect the equity returns due to higher interest rates (Miller and Ratti, 2009).

The oil price impact on equity return can be investigated by identifying the variables by which fluctuations in prices of oil can influence equity returns. Theoretically, there are few transmission instruments that identify this connection. As indicated by the finance, there are two ways. Initially, in microeconomic point of view, the first channel is expected cash flows. Oil is an essential contribution to the production procedure. In this manner, higher oil prices increase the production costs which reduce the profit, expected cash flows and then equity returns. Second, as indicated by the macroeconomic view, oil prices may affect equity returns by means of the discount rate. An oil price increment may result in high inflation rate. The national bank may raise the loan cost to lower the inflation rate. Hence, the oil price increment results in high inflation increase in the discount rate and at the end affects the equity returns returns (Basher et al., 2016).

As far as the observational discoveries in the past studies, the connection of oil price changes with equity return has demonstrated outcomes, showcasing the unstable elements between the two factors after some time. The relationship of oil prices fluctuations with equity returns at firm level can be abridged into three situations. Firstly, it has effect of positive nature on firms related to oil and its substitute. Secondly it has effect of negative nature on oil-utilizing businesses, and thirdly it has no any important impact on the firms not related to oil and its substitute, for example, the financial sector. Broadstock and Filis (2014) finds that there is a contract that Oil and Gas ventures alongside the Mining enterprises will in general be emphatically influenced by positive oil price fluctuations, however, for the alternate businesses inverse is valid, in particular industries. Uncertain discoveries found for the businesses, i.e, energy sector and financial markets (Arouri and Nguyen, 2010) and (Hammoudeh and Li, 2005).

In spite of the fact that previous literature shows the effect of oil price variations on equity returns, there is no accord on the idea of the connection between the two factors where the prices of oil varies profoundly in sectors. The positive relationship in returns of energy sector equity with oil cost increments were observed, however this isn't the situation for not energy related segments which demonstrate a feeble association with fluctuations in oil price. For sure, sectors that create an extensive level of their incomes from oil based items may ordinarily show a positive impact of oil prices, areas where oil is an urgent contribution for their tasks will in general showcase negative relationship to the fluctuations in oil prices (Faff and Brailsford, 1999).

Elyasiani et al. (2011) archive noteworthy proof by taking into account the 9 sectors of an economy to show evident critical relationship of oil prices fluctuations with equity return, in light of the above businesses contrast their utilization of oil and, thus, display an alternate affect to the fluctuations in oil prices. Mohanty et al. (2011) uses the data of both aggregate and industry level and in twelve industries finds out the crucial positive relationship of oil prices with equity return. Moreover, by utilizing linear and non-linear approach, Arouri et al. (2011) examines the short run relationship in mean and standard deviation at aggregate stocks and sector level in europe. Hence, the reaction of equity return to oil price fluctuations recommend that among the two factors quality of relationship vary impressively in industries of an economy. To find correlation, Arouri et al. (2011) applied the VAR-GARCH model to find out the degree of oil prices volatility spillover to Europe and the United States equity returns. The outcomes uncover the presence of noteworthy unidirectional oil price volatility spillover to european returns of equity. Moreover, the US stock shows the bidirectional oil price volatility spillover to equity returns.

In past years, further examinations shown this clear logical inconsistency and finds asymmetric and time varying oil price connection with equity market return (Miller and Ratti, 2009), (Reboredo, 2010) and (Filis et al., 2011). The exact outcomes overwhelmingly bolster up an unbalanced oil prices connection with equity market returns, to reveal and comprehend the non-symmetric reactions of equity returns comes back to basic oil shocks could be especially vital for settling on productive decisions of finance. Basher and Sadorsky (2006), Nandha and Faff (2008), Park and Ratti (2008) and Kilian and Park (2009) find that oil price shocks negatively affect the equity return. Different studies demonstrate the oil price shocks positive impact on equity return (Sadorsky, 2001). Also, researches on the oil price relationship with equity return incorporated for examination of asymmetric oil price shock and its volatility impact. Arouri and Rault (2012) in their research for GCC equity markets have examine the long term asymmetric oil prices connection with equity return. The findings of the investigation give proof that in a non-symmetric way oil price shocks influence the equity returns. Equity market returns rise quicker than they fall as a reaction to oil price fluctuations. This outcome has been approved by the investigation of Cifarelli and Paladino

(2010), who has investigated the asymmetric oil prices relationship with equity returns in the premise of a multivariate GARCH approach. An alternate technique has been connected in an ongoing report directed by Zhu et al. (2016).

Kisswani and Elian (2017) examined the oil prices nonlinear connections with equity return in Kuwait stock by using NARDL approach. Their outcomes gave proof of negative asymmetric oil price impact on equity return. Raza et al. (2016) applied NARDL approach to examine the non-linear connection among oil prices, gold and equity return in developing markets. The results depict the oil prices negative relationship with equity market returns in developing markets (Basher et al., 2012). In addition, Zhu et al. (2016) uses an econometric model to deal with asymmetric connection of oil price shocks with equity returns by isolating oil demand and supply shock. Their findings inferred that oil demand shock affect the equity return contrasted with oil supply shock. Likewise, applied NARDL model to look at the oil price impact on equity returns. Thus, the results suggest the oil demand shocks great influence on equity market return. Most of past literature took into consideration the emerged market to examine oil price shocks connection with equity returns. In fact, not many studies concentrated on Malaysia's equity markets in spite of its developing significance. In addition, the vast majority of these examinations just considered examination of symmetric oil price shocks connection with equity returns and uses NARDL which is exceptionally the latest strategy on examining the asymmetry among factors of intrigue. Examining the non-linear relationship is exceptionally intriguing what's more, applicable in light of the fact that it empowers specialists, organizations' chiefs and policy makers to find out the oil prices connection with equity returns related to increment in oil prices. Furthermore, decline in oil price subsequently they can make proper activity also define procedures to manage those fluctuations in oil prices (Hu et al., 2018).

2.5 Oil Prices & Equity Returns Time-Varying Relationship

During the time of boom and recession, non-linearities in the relationship of oil prices with equity return may take place. These volatilities may occur due to economic crisis or other events, for example, geopolitical pressure or terrorist attacks that change the oil prices and equity returns trend. Previous studies suggest no steady linkage among oil prices and U.S equity return. Mollick and Assefa (2013) find the diverse oil price shocks relationship with US equity return previously. Miller and Ratti (2009) find the negative relationship of oil price with equity return in long run which vanishes in global equity markets. Aside from economic shocks, some of the empirical evidences find the oil price shocks impact on equity return. Cong et al. (2008) explores dynamic oil prices connection with equity returns. Also discovers that the oil price shocks are not measurably critical for many equity markets. Hence, oil price shocks influences equity return in production area and oil related organizations.

Kollias et al. (2013) finds the weaker oil prices relationship with equity returns in US and European markets. Bouri et al. (2016) examine the oil price shocks relationship with Jordanian equity market affected by Arab war. Zhang (2017) find the positive linkage of oil prices with equity returns. Chen (2010) find that after terrorist attack of 9/11 and Iraq war of 2006, the connection of oil prices with equity profits for the Russian index move towards negative. Cameron and Schnusenberg (2009) recommends that the external events result in rise in volatility among prices of oil and additionally equity market, which thus produce non-linearities in the oil prices relationship with equity return. The market might be efficient at retaining the data from terrorist attacks to wars (Kollias et al., 2013), despite the fact that geopolitical and common agitation increases the negative relationship among oil prices and equity returns. It may happen due to turmoil expanding vulnerability of future supply of oil. In fact the oil explicit interest shocks will in general negatively affect equity returns. A couple of researches have analyzed the substantial movements in oil prices influence on equity return. Most of the studies find the asymmetric impact on equity return due to extensive positive or negative movements in oil prices (Reboredo and Ugolini, 2016). However, it turned out to be significantly more articulated.

Lee and Chiou (2011) finds asymmetric oil price connection with equity returns. Not extensive literature is available on oil price time varying relationship with equity market returns. According to some researcher oil prices have negative relationship with equity returns and therefore some studies show the oil prices positive relationship with equity market returns. Oil price shocks has pre-dominent importance in examining the oil prices time varying relationship with equity market return. Previous researches ignored the co-movement of oil prices with equity market return. However, the increment in oil prices has negative relationship with equity return.

Few studies are available on the dynamic correlation of oil price with equity return. Ewing and Thompson (2007) develop first methodology on the oil prices dynamic co-developments with equity returns, utilizing the repeating segments. Narayan et al. (2010) by applying a bivariate E-GARCH approach additionally investigate the oil prices relationship with equity return. The study distinguished three noteworthy factors which causes oil prices negative connection with equity return. Jammazi and Aloui (2010) applied DCC deviated E-GARCH framework to look at the connection of oil price with equity return. They identified two scenes of arrangement conduct, one in respect to higher and lower change routine and the other to lower and higher fluctuation routine, and provide a proof in favor of lower and higher fluctuation routine. Besides this univariate GARCH framework applied to find out the connection of oil costs with equity return (Lee and Chiou, 2011). The study inferred that noteworthy oil price shock results in negative effect on index return, yet in lower oil price fluctuations it does not appear. At last, Choi and Hammoudeh (2010) applied a multivariate econometric model and demonstrate an expanding relationship of oil prices with commodity yet diminishing relationships with the index. Chang et al. (2009) in accordance with the DCC deviate model show additionally oil prices mean and volatility spillover to indices. In the recent investigation a strong quantitative strategy is applied, to be specific DCC deviate GARCH, or DCC deviate GJR-TARCH model, which was not applied before to explore the oil prices time-varying relationship with equity returns, considering the source of shocks in oil prices.

Moreover, this study focused on oil price relation with equity returns by taking into consideration the oil importer or exporter country. All the more explicitly, Park and Ratti (2008) find the oil prices positive relationship with equity returns in oil exporter countries, whereas finds the negative oil price impact on oil importer countries while conducting a research on 13 european countries. Miller and Ratti (2009), then again, presumed that oil importer and oil exporter countries returns not responds to oil price shock whether these are negative or positive shock. The DCC GARCH-GJR progressively assessed for substantial oil price shocks time-varying relation with equity returns, whereas in multivariate DCC-GARCH deviate GJR model less requires number of parameters. There is a pattern in economic related oil prices time changing connection with equity returns. This study analyzes the dynamic oil prices connection with equity returns and by applying a non-linear ADCC-GARCH model and it is altogether append to the current studies of this area of research. Likewise, this study gives a delineated investigation of the adjustments in the time-changing relationship of oil prices with equity return to identify the oil price shock effect on equity return.

2.6 Oil Price Shocks and the Equity Returns Relationship of the Oil Importers and the Oil Exporters

Oil prices differently affect the oil exporter and importing countrys equity returns. Increment in oil prices has positive relationship with equity returns of oil exporter countries because it increases the GDP of the country. However, an expansion in oil prices may adversely affects the oil importers equity return, as oil is the most vital variable of economy. Extent part of the previous researches has explored the oil prices impact on equity return of oil importer and exporter countries (Filis et al., 2011). Different researchers concentrated on at least one oil importing country (Bouri, 2015) or at least one exporting country (Arouri and Rault, 2012). The increase in oil prices positively influence equity returns of oil exporters and adversely affect the oil importing countries (Arouri and Rault, 2012). The couple of research analyzed the impact of the diverse kinds of shocks in oil prices crosswise over oil importer countries and oil exporter countries (Kilian, 2009). The outcomes may fluctuate. Concentrating on simply oil importing countries, Cunado and de Gracia (2014) explore the oil prices negative relationship with equity returns.

Filis et al. (2011) find the oil price shocks positive impact on equity returns whereas specifically negative impact identified through oil demand shocks. However, shocks in oil supply have no influence on oil importer as well as oil exporter. Wen et al. (2014) states that oil price shocks results in growth of equity return in oil importer countries as the rise in oil supply decreases the price. However, in oil exporter countries there is nonlinear relationship with equity prices at first fall, and then increment in long run shows the contrast of oil demand in short and in long term. Hence, total oil demand shocks have positive with oil importer and exporters equity return.

Scholtens and Yurtsever (2012) investigate the oil price shocks relationship with european equity returns and discover that from industry to industry and country to country due to fluctuations in its price, oil price shocks vary. Lee et al. (2012) examine the oil prices relationship with equity returns by using monthly data in G7 countries and discover the significant oil prices impact on equity return of G7 countries index. Abeysinghe (2001) finds oil price negative impact on oil exporting countries like Malaysia and Indonesia. Despite of the fact that increment in oil prices positively affect the financial markets of Malaysia and Indonesia and suggests the oil prices long term relation with equity returns of these economies. Cunado and De Gracia (2005) examine the oil prices relationship with Asian stock markets which may include the indices of Japan, Malaysia, Philippines, Singapore, South Korea and Thailand and discover that oil price affects the equity return of oil exporters and oil importers in short term and the impact is significant and noteworthy. Strangely, the relationship turns out to be increasingly noteworthy at the point when oil price is characterized in country's monetary standards. Ran and Voon (2012) find that oil costs don't significantly affect financial movement in Hong Kong, Singapore, South Korea and Taiwan. Previous studies on GCC nations are excessively heterogeneous. The results are conflicting on the grounds that most of the GCC nations have some basic attributes and are intensely dependent on crude oil and in this way affects due to fluctuations in crude oil price, regardless of whether they rely upon oil in various aspects.

Expanding on reason that equity returns of oil exporter resultantly increases due to positive oil price shocks. Bjørnland (2009) find the oil price shocks positive impact on equity return. As indicated, if production cost increases which increase the expenses which leads to inflation and requires more investment which lowers the unemployment which brings the positive impact on equity returns. Oil price shocks increase in oil importing countries negatively influence the equity returns. On the grounds that oil cost increment results in higher manufacturing cost, hence oil is the vital input of production as indicated by (Chen and Chen, 2007) and (LeBlanc and Chinn, 2004). Oil prices increment results in rise in oil product prices as the burden transfers to their customers which as a result diminishes the product demand and affects the consumer behavior (Bernanke et al., 2006). According to Filis et al. (2011), Aloui et al. (2012) and Guesmi and Fattoum (2014) decrease in production leads to unemployment which causes the negative relation with equity returns.

Elder and Serletis (2009) finds the oil price shock relationship with equity returns in US, Canada, Japan, Germany, and UK. He finds the noteworthy oil price shock relationship with equity return of US and UK whereas finds no impact on Germany, Canada and Japan's stock. Shocks in oil price increases the oil prices which rises manufacturing cost and affects the product prices which causes inflation and unemployment and as a result diminishes the investment (Lardic and Mignon, 2008). Fama (1990) states that an expansion in oil costs unfavorably influences financial activities (e.g., expands swelling and financial subsidence). He presumes that the oil price shock has more noteworthy relationship with financial development. Hamilton (1996) finds that increments in oil price are significantly more imperative than oil price diminishes. Moreover, oil price fluctuations are unpredictable in emerging markets. Papapetrou (2001) finds that the oil value shocks contrarily influences business levels. He finds that expanding cost of production result in lower yield also, increases the unemployment level in the economy. Previous studies committed oil prices connection with macroeconomic factors.

Barsky and Kilian (2004) find that during 1970's stagflation has been seen which is probably not brought up by supply influences. They reason that oil cost increments independently going to reignite stagflation. Likewise, a continued increment in oil prices is far-fetched without a favorable macroeconomic condition in OECD nations. Balke and Wynne (2007) find that oil price fluctuations might be related with changes in monetary action. They clarify the connection utilizing four principle speculations. To start with, the supply-reaction may cause a decrease in an essential resource generation accessibility, which brings down forecasted returns. Secondly, from oil importers revenue exchanges to oil exporters may influence the stock markets. Thirdly, the relationship may result from a genuine parity impact. Fourthly, fiscal approach may prompt a discernible connection between monetary movement and oil prices. Huang and Feng (2007) finds that rise in prices of oil has negative affect on the economy of oil importing countries oil prices are inversely associated with equity returns. Cuñado and de Gracia (2003) investigate oil price shock influence on economic variables in 14 countries of Europe and explore that oil price shocks long run relationship with inflation rate which causes a short run impact on growth rate of an economy. Jones et al. (2004) overview the hypothetical oil price shock influence on the economic factors.

Moreover, the demand for oil and oil related product increases when country starts facing fast modernization. The largest developing countries are India, China and Russia. The two largest energy consuming countries are India and China. Therefore, these countries are mainly more sensitive to oil price shock. Oil price shocks due to increase in demand for oil and oil related products results in shrinkage in the supply of oil and oil related products. Previous studies show that if the oil price shock occurs due to financial growth and development than it results in positive volatility spillover from oil prices to equity returns. Besides this, if the oil price shocks are due to supply of oil and oil related products than it will results in negative volatility spillover from oil prices to equity returns. As opposed to BSE and HSI, Russia is the primary oil exporter in the world. The impacts of stun due to worldwide oil generation or its supply vary for the economy of Russia, hence there might be substitution impacts among the oil generated by that particular economy. Moreover, it is vital to plainly comprehend the connection between equity returns of rising economies and development due to oil price fluctuations.

The political scenerio in Arab countries is the main factor which affect the prices of oil (Kilian and Murphy, 2014). Likewise, oil value stuns are neither essential nor adequate to clarify stagflation in GDP. The study provides the empirical evidence that oil costs have indirect impacts on financial movement since oil costs have distinctive effects on equity returns as the increase in oil price results in devaluation of equity returns. Huang et al. (2005) investigate the effect of oil shock on the stocks of USA, Canadian and Japanese. They discover that if the change is beneath the benchmark then oil price shocks limitedly affect these stocks. Oil costs slack production cost and lead customer costs. Kilian and Park (2009) finds that all price shocks in oil are not same, mostly shocks in oil price are caused by a blend of solid worldwide demand of oil products and desire moves that expansion prudent oil demand explicitly. These desire shifts shows the probability of expected shortage in the supply of oil. 20% of equity returns are anticipated by fluctuations in oil prices in US stock.

The oil price shock response is reliant upon either the economy is oil exporter or oil importer. Also, it propose that in short and long term increase or decrease in oil price shocks affects equity returns alternatively. It also shows that non-linear behavior of oil prices may also affects equity returns. Conditional correlation is applied to measure the time varying oil prices impact on equity returns (King and Wadhwani, 1990), and (Lee, 1992). During crisis period oil prices conditional correlation increases with equity returns. Hamao (1988) find that in GARCH model conditional correlation increases in 1987. Susmel (2001) uses ARCH model and find that U.S stock market is essentially connected to volatility which demonstrates crisis impacts. Forbes (2004) finds that during crisis period oil price volatility affects the Asian and Russian market. Hence, proof on finance related crisis isn't generally convincing. Barsky and Kilian (2004) find that there was no any impact on Paris stock market during crisis period. However, it was just because of interdependence among the markets. Corsetti et al. (2005) finds a relationship among oil price shocks and equity returns during crisis period. Froot et al. (2001) affirmed the presence of the crisis period impact. The co-developments of US stock and OECD nations examined by (Guesmi et al., 2013). The study employ a multivariate DCC-GARCH, their outcomes demonstrate the volatility spillover from US to OECD, aside from Germany, Italy, UK and also, to a limited degree, Japan, because of the presence of interdependence among stock markets. The crisis may also affects the other OECD members during crisis period.

Previous studies applied multivariate GJR DCC-GARCH models to examine the volatility spillover during crisis period. It recognizes two principle discoveries. Oil cost shocks in times of worldwide crisis or worldwide business cycle changes (rise or fall) seem to have a noteworthy connection of oil price with equity returns in oil importer and exporters. Previous studies disclose higher and numerous pinnacles which concur with major occasions in oil exporting countries. Oil prices impact on equity returns is more noteworthy in oil exporter countries as compared to oil importing countries. The oil prices time-changing relationship with equity returns exists in oil exporters and importers. By employing a DCC-GARCH deviated models, discover that restrictive change in oil and equity costs continues for oil-bringing in and oil-trading economies. Hence, time-varying relationships rely upon the oil price shocks. In OPEC oil demand shocks are higher than oil supply shocks (Filis et al., 2011).

2.7 Hypothesis of the Study

H1: There is a long run connection of oil price with equity return of Asian markets.

H2: There is a short run connection of oil price with equity return of Asian markets.

H3: There is a volatility and mean spillover from oil price to equity return of Asian markets.

H4: There is an oil price asymmetric connection with equity return in Asian markets.

H5: There is a time-varying relationship between oil prices and equity returns of Asian markets.

H6: The relationship of oil prices with equity returns is different in oil importers and oil exporters.

Chapter 3

Methodology & Data Description

This section covers data description and methodology. It explains data, variables and sources of data. The econometric models used to capture the variables dynamics.

3.1 Population and Sample of Study

The sample period for each country is different as the data for equity market is linked with the availability of data.

TABLE 3.1: Details of Sample Countries

Sr.No.	**Country**	**Index**	**Period**
1	INDIA	BSE	1st July 1997- 30th Nov 2018
2	CHINA	HSI	2nd Jan 1990- 30th Nov 2018
3	KOREA	KS11	1st July 1997 - 30th Nov 2018
4	JAPAN	N225	4th Jan 1997 - 30th Nov 2018
5	ISRAEL	TA125	8th Oct 1992 - 29th Nov 2018
6	TAIWAN	TWII	2nd July 1997 - 30th Nov 2018
7	PAKISTAN	KSE	2nd Jan 1997 - 30th Nov 2018
8	SRILANKA	CSE	1st July 1997 - 30th Nov 2018
9	MALAYSIA	KLSE	3rd Dec 1993 - 30th Nov 2018

10	AUSTRALIA	AXJO	23rd Nov 1992 - 30th Nov 2018
11	PHILIPPINE	PSESI	14th Aug 2009 - 30th Nov 2018
12	INDONESIA	JKSE	1st July 1997 - 30th Nov 2018
13	SINGAPORE	FTSEST	10th Jan 2008 - 9th Feb 2018
14	NEWZEALAND	NZ50	10th Jan 2008 - 9th Feb 2018
15	SAUDI ARABIA	TASI	6th Jan 2007 - 29th Nov2018

3.2 Description of Variables

3.2.1 Equity Market Returns

The following equation can be used to estimate the equity market return:

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

Where $R_{j,p}$ denotes the current month returnp; and $P_{j,p}$ and $P_{j,p-1}$ are closing values of Indices for current month p and previous monthp-1 respectively.

3.2.2 Oil Price Returns

The following equation can be used 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 month return t; and $O_{k,t}$ and $O_{k,t-1}$are closing prices for current month t and previous month t-1 respectively.

3.2.3 Oil Price Shock

This study examines the asymmetric impact of positive and negative oil price shocks. To examine the asymmetric impact of positive and negative oil price shocks, equity returns are utilize. The asymmetries during the pre-crisis and the crisis and post crisis periods also considered in this study. The equation is:

$$R_{i,t} = \beta_0 + \beta_1 \Delta WTI_t^+ + \beta_2 \Delta WTI_t^+ Crisis_t + \beta_3 \Delta WTI_t^+ AfterCrisis_t + \beta_4 \Delta WTI_t^-$$
$$+ \beta_5 \Delta WTI_t^- Crisis_t + \beta_6 \Delta WTI_t^- AfterCrisis_t + \beta_7 Crisis_t + \beta_8 AfterCrisis_t +$$
$$\beta_9 Crisis_t D_t(\Delta WTI_t > 0) + \beta_{10} Crisis_t D_t(\Delta WTI_t < 0)$$
$$+ \beta_{11} AfterCrisis_t D_t(\Delta WTI_t > 0) + \beta_{12} AfterCrisis_t D_t(\Delta WTI_t < 0) + \epsilon_{i,t} \tag{3.3}$$

In the above equation,$\Delta \mathrm{WTI}_t{}^+$ denotes the percentage positive change in WTI price, $\Delta \mathrm{WTI}_t{}^-$ denotes the percentage decrease in WTI price. The term in the equation i.e. $\mathrm{D}_t(\Delta \mathrm{WTI}_t > 0)[\mathrm{D}_t(\Delta \mathrm{WTI}_t < 0)]$ denotes a dummy variable that exhibits the value of 1 in case of positive and negative change.β_1 denotes the positive oil price change in the pre-crisis period.β_2 denotes the positive oil price change during crisis period. β_3 denotes the positive oil price change after crisis period.β_4 denotes the impact of a negative oil price change during the crisis period. $\beta_4 + \beta_5$ measures the negative oil price change impact during crisis period and $\beta_4 + \beta_6$ measures the effect of a negative oil price change after the crisis period.

3.3 Econometric Model

3.3.1 Stationarity

Unit root test is applied to check the stationarity of data. The null hypothesis in unit root analysis can be examined through two tests (i) Augmented Dickey-Fuller (ADF) Test and (ii) Phillips-Perron Test. The ADF test identifies the unit root presence. The equation is defined as

$$V_j = \alpha V_{t-1} + \mu_t \tag{3.4}$$

In the above equation, V_j denotes the variable, j denotes the time frame, α denotes coefficient, and μ_t denotes error term. The equation is defined as

$$\Delta V_j = (\alpha - 1)\ V_{j-1} + \mu_t = \delta V_{j-1} + \mu_t \tag{3.5}$$

In this equation, Δ denotes the difference. Unit root test is equivalent to $\delta = 0$. ADF test is basically applied on normally distributed data. Phillip-Perron test is applied on heterogeneous data and not normally distributed data. The equation can be defined as:

$$V_t = \alpha_o + \alpha_1 V_{t-1} + \alpha_t t - T/2 + \mu_t \tag{3.6}$$

The basic model for null hypothesis is as follows

$$V_j = V_{j-1} + \mu_t \tag{3.7}$$

In which E (ut) = 0.

3.3.2 Co-Integration

If the non-stationary time series converts into stationary after difference, then series known as integrated of same order I(1) series. If linear combination exists in series of integrated of same order it is called Stationarity without differencing. Such existence of symmetric combination known as co-integration. Co-integration analysis classified into two tests: (i) residual-based tests ii) maximum likelihood-based tests. Residual-based tests introduced by (Engle et al., 1989) introduced the whereas maximum likelihood-based tests introduced by (Johansen, 1991) and (Johansen and Juselius, 1990).

3.3.3 JJ Approach

Johansen and Juselius (JJ Approach) applied to test the co-integration in non-stationary data. The null hypothesis denotes absence of co-integration in two or more series. The vector autoregressive (VAR) model is applied to examine the absence of co-integration in long run. In VAR model all the variables are endogenous. To investigate the long-run connection among variables, the Johansen and Juselius approach is applied. According to Johansen and Juselius there are two likelihood ratio tests to determine cointegrated factors. Null hypothesis at most m co-integrating factors evaluated by the maximal eigenvalue model against the alternative of m+1 co-integrating factors. The model can be defined as,

$$\Gamma_{max} = -Tln(1 - \Gamma_{m+1}) \tag{3.8}$$

In this equation $\Gamma_{m+1},$, Γ_n denotes the n-m smaller squared correlations and T denotes the number of observations. A trace statistic tests the null hypothesis of m co-integrating factors against the alternative of r or more co-integrating factors. This can be defined as

$$\Gamma_{trace} = -T \sum ln(1 - \Gamma_i) \tag{3.9}$$

In Johansen procedure, lag length is decided on the basis of Akaike Information Criterion (AIC).

3.3.4 Variance Decomposition Analysis

In variance decomposition analysis is used to analyze equity markets response in accordance with the shock in oil market. The impact of oil market on equity market is examined through time period, if the shock is identified through error term. F test is an inside example causality test and not enables to measure the overall quality of the causality within factors outside the time frame. So as to analyze beyond test causality, variance decomposition analysis is applied which parts the change of the figure mistake of a specific variable into extents inferable from one market shock to every factor in the framework. This model exhibits a real separation of the adjustment in the estimation of the variable in a specific period due to changes in a similar variable notwithstanding different factors in current time.

3.3.5 Impulse Response Analysis

The difference among impulse response analysis and variance decomposition analysis is that impulse response model examines the shocks effect of one market to another on daily basis. The variance decomposition test examines the cumulative shocks. The impulse response approach exhibits the impact of one market on other market and this model also investigate the shocks effect on another market.

3.3.6 ARMA GARCH

Liu and Pan (1997) identified the two-stage GARCH-in-mean approach (GARCH-M) to examine the volatility spillover from oil price to equity return. In first step, ARMA (1,1)-GARCH (1,1)-M model is used to model the equity index return series as:

$$R_{k,t} = \beta_0 + \beta_1 R_{k,t-1} + \beta_2 \sigma_t^2 + \beta_3 \epsilon_{k,t-1} + \mu_k \tag{3.10}$$

$$\sigma_{k,t}^2 = \gamma_0 + \gamma_1 U_{k,t-1} + \gamma_2 \sigma_{k,t-1}^2 \tag{3.11}$$

In the above equation, $R_{k,t}$ denotes the oil market return,$\epsilon_{k,t-1}$ denotes the residual (or unexpected return) which is normally distributed with mean zero and time-conditional variance $U_{k,t-1}$.The ARMA(1,1) and MA(1) structure in the model adjusts serial correlation in the data. In the second stage, standardized residual and its square used to find out the mean and volatility spillover effects across markets and substitute into the mean and volatility equations of equity market as:

$$R_{j,t} = \beta_0 + \beta_1 R_{j,t-1} + \beta_2 \sigma_t^2 + \beta_3 \epsilon_{j,t-1} + \omega_j \mu_{k,t} + \mu_{j,t} \tag{3.12}$$

$$\sigma_{j,t}^2 = \gamma_0 + \gamma_1 U_{j,t-1}^2 + \gamma_2 \sigma_{j,t-1}^2 + \phi_j e_{j,t}^2 \tag{3.13}$$

Where $\epsilon_{j,t-1}$ denotes the oil market standardized residual series which represents the mean spillover. The exogenous variable ${\sigma^2}_{j,t-1}$ the square of the standardized residual series is included to examine the volatility spillover in the conditional volatility equation. The subscript j refers to specific market.

3.3.7 DCC GARCH

Engle (2002) proposed the multivariate generalized auto-regressive conditional heteroscedasticity (GARCH) model that is extended to test the dynamic conditional correlations (DCC). The DCC GARCH model demonstrates coefficient correlation of standardized residuals, and therefore accounts heteroscedasticity. Second, the model permits incorporating extra informative factors in the mean equation to guarantee that the model is not mis-specified. Third, the multivariate GARCH model can be employed to inspect multiple asset returns without including such a large number of parameters. Therefore, it represents the asymmetries in conditional variances, co-variances and correlations. Following Bollerslev et al. (1992),Engle (2002), empirical studies started with the supposition that equity market return from the k series are multivariate normally distributed with zero mean and conditional variance and covariance matrix.

$$R_t = (1 - a^{DCC} - b^{DCC})\overline{R} + \theta R_{t-i} + \epsilon_{t-i} + \epsilon_{t-1} \tag{3.14}$$

In the above equation R_t shows the time varying conditional correlation. $\overline{R}$ is the unconditional covariance matrix. Whereas a,b and θ are the coefficients and ϵ_{t-i} shows the univariate standardized residual. ϵ_{t-1} exhibits the conditional correlation. When $a^{DCC}+ b^{DCC}<1$ it shows that model is stable and condition is stable and perfect. When $a^{DCC}+ b^{DCC} =1$ shows persistence of correlation.

3.3.8 NARDL

Increments in oil price impact the macroeconomic factors than oil price diminishes in outright esteem terms. Substantial oil price shocks are regularly viewed as the significant reason for monetary downturns. The most prominent influence of oil price shocks noticed in crisis of 1973. A negative connection of oil price shocks with financial activities observed by a progression of studies by (Hamilton, 1983). Moreover, (Mork, 1989) document the non-linear impact of oil price shocks on financial activities. So as to recognize the non-linear impact of oil price shocks, oil price shocks divided into positive and negative:

$$WTI_t^+ = max(0, D(WTI)_t) \tag{3.15}$$

$$WTI_t^- = min(0, D(WTI)_t) \tag{3.16}$$

Here, the variable WTI^+ represents the positive oil price shocks and WTI^- represents the negative ones.

The NARDL approach is a co-integration test that assumes non-linearity through partial sum of positive and negative variations to detect the asymmetric effects of oil price shocks in long run and short run. NARDL tests both issues of non-stationarity and nonlinearity in unrestricted error correction model. Following Shin et al. (2011), equation can be outlined in an ARDL context by (Pesaran et al., 2001) as:

$$\Delta S_t = \alpha + \beta_0 S_{t-1} + \beta_1 WTI_{t-1}^+ + \beta_2 WTI_{t-1}^- + \sum_{(i=1)}^{p} \gamma_i \Delta S_{t-i} + \sum_{(i=0)}^{q} \theta_i^+ \Delta WTI_{t-1}^+$$
$$\theta_i^- \Delta WTI_{t-1}^- + \mu_t \tag{3.17}$$

The first part of the equation represents long run effect of increase and decrease in oil prices on equity returns and second part captures the short run effect of increase and decrease in oil prices on equity returns.In this equation, p and q are lag orders. $\beta_1\text{WTI}^+{}_{t-1}+\beta_2\text{WTI}^-{}_{t-1}$ represents the long run impact of rise and fall in oil price. $\beta_0\text{S}_{t-1}$ represents the rise and fall in the equity return in long run.$\sum^q{}_{(i=0)}\theta_i{}^+$ captures the short run effect of oil price increases on stock market prices, while $\sum^q{}_{(i=0)}\theta_i{}^-$ shows the effect of oil price decreases on equity return in short run. $\sum^{p}{}_{(i=1)}\gamma_i\Delta\mathrm{S}_{t-i}$ shows the rise and fall in equity return due to variations oil prices.μ_t denotes the error term. This equation shows that the NARDL model examines the asymmetric short run and long run oil price variations impact on the stock market prices.

3.3.9 Methodology for Relationship Difference in the Oil Importers and Oil Exporters

The current study followed a methodology which has similarities with the methodology of Arouri et al. (2011). The multi-factor model of the study can be written as follows:

$$R_{i,t} = a + b \times R_{oil,t} + c \times R_{oil,t} \times D + \epsilon_{i,t} \tag{3.18}$$

In the above equation, Rit denotes the daily equity market return, Roil,t denotes the oil price return. Whereas D=1 if oil importer otherwise D=0 If not oil importing. There is not a linear oil price impact on equity return (Zhang, 2017). Increment in oil prices effect more strongly than diminishes equity return of oil importer countries. However, fall in oil price effects more strongly than rise in oil price in oil exporter countries. The asymmetric oil prices reaction on equity return can be tested by dividing the oil price shocks into negative and positive as in (Arouri et al., 2011)

Chapter 4

Results & Discussion

4.1 Data Analysis

This chapter covers the data analysis and discussion of results. The chapter is classified into five sections. First section includes the analysis of co-integration. Second section exhibits the results of ARMA-GARCH. Third section depicts the results of DCC-GARCH. Fourth section exhibits the results of NARDL. Fifth section includes the analysis of relationship difference in oil importer and exporter countries.

4.1.1 Descriptive Statistics

The table 4.1 reports the description statistics of oil market and equity market of sample countries.

The table includes the daily returns of Australia (AXJO), China (HIS), India (BSE), Indonesia (JKSE), Israel (TA125), Japan (N225), Korea (KS11), Malaysia (KLSE), New Zealand (NZ50), Pakistan (KSE), Philippine (PSESI), Saudi Arabia (TASI), Singapore (FTSEST), Sri Lanka (CSE) and Taiwan (TWII) stocks.

The average return on WTI (Western Texas International) is 0.012% on daily basis. The maximum return on daily basis is 1.84% and the maximum loss on daily basis is 1.83%. The average return on AXJO (Australia stock) is 0.019% on

Table 4.1: Descriptive Statistics

Returns	Mean	Median	SD	Skewness	Minimum	Maximum
WTI	0.00012	0.0000	0.1587	0.0305	-1.8391	1.8456
AXJO	0.00019	0.0000	0.0088	-0.486	-0.0870	0.0572
HIS	0.00032	0.0000	0.0153	-0.0208	-0.1473	0.1725
BSE	0.00028	0.0000	0.3307	-0.0017	-2.5668	2.5956
JKSE	0.00027	0.0000	0.0132	-0.2264	-0.1273	0.1313
TA125	0.00027	0.0000	0.0114	-0.4522	-0.1054	0.0769
N225	0.00136	0.0000	0.1241	83.914	-0.1211	10.564
KS11	0.00016	0.0000	0.0147	-0.2564	-0.1280	0.1128
KLSE	0.20005	0.0000	0.0117	0.5212	-0.2415	0.2082
NZ50	0.00021	0.0000	0.0048	-0.4554	-0.0494	0.0581
KSE	0.00053	0.0000	0.0118	-0.3026	-0.0993	0.0999
PSESI	0.00026	0.0000	0.0141	0.1587	-0.1308	0.1617
TASI	-1.8500	0.0000	0.0081	-1.5685	-0.1033	0.0908
FTSE	-6.9000	0.0000	0.0062	-0.5303	-0.0839	0.0727
CSE	0.00027	0.0000	0.0090	0.3153	-0.1390	0.1828
TWII	2.69000	0.0000	0.0117	-0.2109	-0.0993	0.0851

daily basis. The maximum return on daily basis is 5.72% and the maximum loss on daily basis is 8.7%. The average return on HSI (China stock) is 0.032% on daily basis. The maximum return on daily basis is 17.25% and the maximum loss on daily basis is 14.73%. The average return on BSE (India stock) is 0.028% on daily basis. The maximum return on daily basis is 259.56% and the maximum loss on daily basis is 256.68%. The average return on JKSE (Indonesia stock) is 0.027% on daily basis. The maximum return on daily basis is 13.13% and the maximum loss on daily basis is 12.73%. The average return on TA125 (Israel stock) is 0.027% on daily basis. The maximum return on daily basis is 7.69% and the maximum loss on daily basis is 10.54%. The average return on N225 (Japan stock) is 0.0136% on daily basis. The maximum return on daily basis is 1056.4% and the maximum loss on daily basis is 12.11%. The average return on KS11 (Korea stock) is 0.016% on daily basis. The maximum return on daily basis is 11.28% and the maximum loss on daily basis is 12.8%. The average return on KLSE (Malaysia stock) is 20% on daily basis. The maximum return on daily basis is 20.82% and the maximum loss on daily basis is 24.15%. The average return on NZ50 (New Zealand stock) is 0.021% on daily basis. The maximum return on daily basis is 5.81% and the maximum loss on daily basis is 4.94%. The average return on KSE (Pakistan stock) is 0.053% on daily basis. The maximum return on daily basis is 9.99% and the maximum loss on daily basis is 9.99%. The average return on PSESI (Philippine stock) is 0.026% on daily basis. The maximum return on daily basis is 16.17% and the maximum loss on daily basis is 13.08%. The average return on TASI (Saudi Arabia stock) is 185% on daily basis. The maximum return on daily basis is 9.08% and the maximum loss on daily basis is 10.33%. The average return on FTSEST (Singapore stock) is 6.9% on daily basis. The maximum return on daily basis is 7.27% and the maximum loss on daily basis is 8.39%. The average return on CSE (Sri Lanka stock) is 0.027% on daily basis. The maximum return on daily basis is 18.28% and the maximum loss on daily basis is 13.90%. The average return on TWII (Taiwan stock) is 26% on daily basis. The maximum return on daily basis is 8.51% and the maximum loss on daily basis is 9.93%.

4.2 Co-integration Analysis

The Co-integration Analysis is applied to test the long term and short term relation of oil prices with equity returns. In co-integration analysis, the first step is to conduct the Stationarity test. In this study, ADF (Augmented Dickey Fuller) test and Phillips Perron test has been applied. As ADF test is use to apply on normally distributed data whereas Phillips Perron test is applied on not normally distributed data. The table-4.2 exhibits that at level all the series are non-stationery and at trend and intercept all the series are stationary in ADF test. In Phillips Perron model, at level all the series are non-stationery and at trend and intercept all the series are stationary which shows that all the series are I(1) integrated of same order. As data is integrated of same order so JJ approach is applied to explore the long run connection of oil price with equity return.

TABLE 4.2: Unit Root Analysis

	ADF-Level	**ADF 1st Difference**	**PP-Level**	**PP-1st Difference**	**Integration**
	Intercept	**Trend &Intercept**	**Intercept**	**Trend &Intercept**	**Level**
Ln WTI	0.4165	0.0000	0.5618	0.0000	I(1)
Ln AXJO	0.2640	0.0000	0.0367	0.0000	I(1)
Ln HIS	0.0929	0.0000	0.0930	0.0000	I(1)
Ln BSE	0.4165	0.0000	0.4973	0.0000	I(1)
Ln JKSE	0.5643	0.0000	0.5790	0.0000	I(1)
Ln TA125	0.0598	0.0000	0.0598	0.0000	I(1)
Ln N225	0.0823	0.0000	0.0688	0.0000	I(1)
Ln KS11	0.4876	0.0000	0.4992	0.0000	I(1)
Ln KLSE	0.1163	0.0000	0.1173	0.0000	I(1)
Ln NZ50	0.7805	0.0000	0.7814	0.0000	I(1)
Ln KSE	0.6671	0.0000	0.6617	0.0000	I(1)
Ln PSESI	0.7611	0.0000	0.7223	0.0000	I(1)
Ln TASI	0.8098	0.0000	0.8065	0.0000	I(1)
Ln FTSEST	0.8266	0.0000	0.8257	0.0000	I(1)
Ln CSE	0.5426	0.0000	0.5446	0.0000	I(1)
Ln TWII	0.4332	0.0000	0.4334	0.0000	I(1)
1%Crit. Value	-3.4491	-3.9848	-3.4491	-3.9848	-
5% Crit. Value	-2.8697	-3.4229	-2.8697	-3.4229	-
10% Crit. Value	-2.5711	-3.1344	-2.5711	-3.1344	-

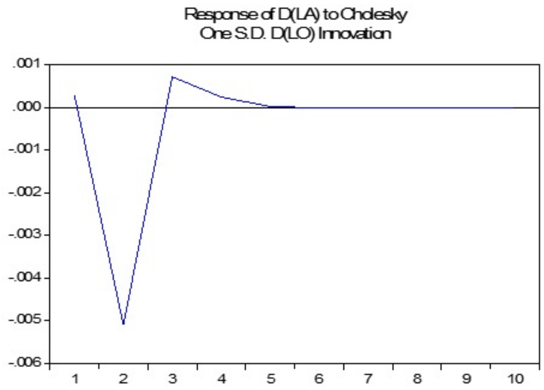
Table 4.3: Bi-variate Co-integration Trace Statistics

Variable	**Hypothesis**	**Eigen Value**	**Trace Stat.**	**Prob.**
WTI- AXJO	None	0.027310	9.525437	0.2450
	At most 1	0.010666	3.688720	0.0548
WTI- HSI	None	0.025461	8.871853	0.2970
	At most 1	0.011686	4.043597	0.0443
WTI- BSE	None	0.018135	6.295783	0.5756
	At most 1	2.339045	2.339045	0.1262
WTI-JKSE	None	0.019418	6.745528	0.5197
	At most 1	0.005908	2.038390	0.1534
WTI-TA125	None	0.025969	9.051547	0.2819
	At most 1	0.011303	3.910443	0.0480
WTI-N225	None	0.018631	6.469469	0.5537
	At most 1	0.011391	3.940992	0.0471
WTI-KS11	None	0.018943	6.578988	0.5401
	At most 1	0.007276	2.512264	0.1130
WTI-KLSE	None	0.020029	6.960082	0.4939
	At most 1	0.013417	4.646643	0.0311
WTI-NZ50	None	0.038033	13.33865	0.0696
	At most 1	0.002450	0.843693	0.3583
WTI-KSE	None	0.033458	11.70635	0.1222
	At most 1	0.004891	1.686548	0.1941
WTI-PSESI	None	0.013614	4.715455	0.7772
	At most 1	0.004141	1.427582	0.2322
WTI-TASI	None	0.027430	9.567657	0.2419
	At most 1	0.003393	1.169168	0.2796
WTI-FTSEST	None	0.030987	10.82810	0.1630
	At most 1	0.005025	1.732785	0.1881
WTI-CSE	None	0.019981	6.943219	0.4959
	At most 1	0.006305	2.175626	0.1402
WTI-TWII	None	0.016159	5.604068	0.6644
	At most 1	0.008255	2.851463	0.0913

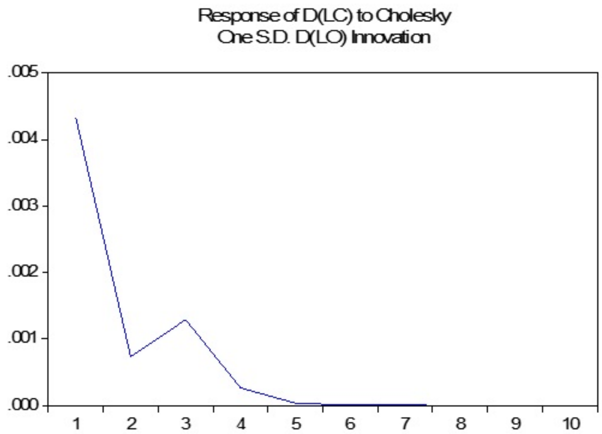
The table-4.3 shows the results od VAR model that has been applied in which 2 lags have been used and exhibits no co-integration among oil prices and equity returns of Asian market. Therefore, the null hypothesis of no co-integration of oil price with equity returns has been accepted and alternative hypothesis of At Most 1 is accepted in different cases at 5% level.

4.2.1 Impulse Response

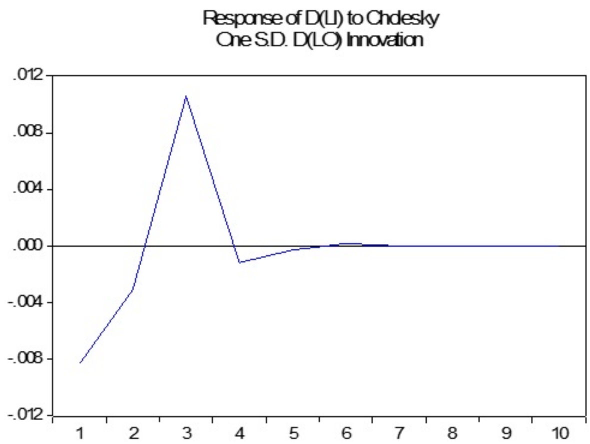
AUSTRALIA



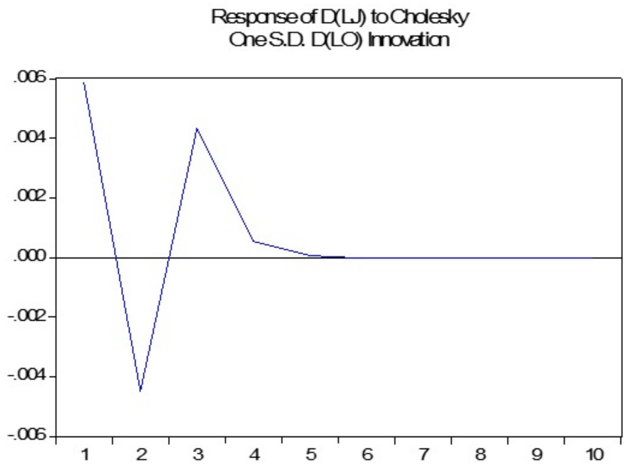
CHINA



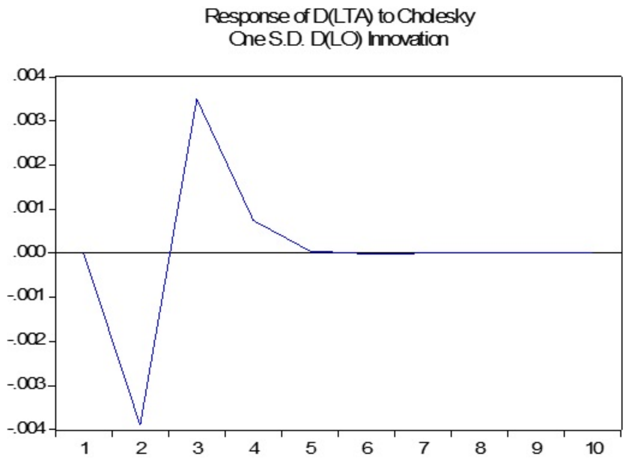
INDIA



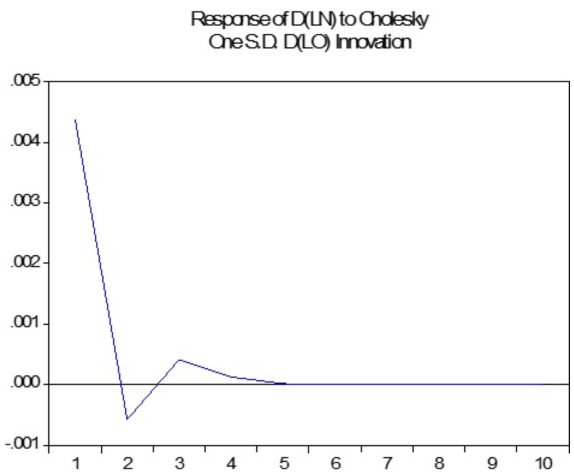
INDONESIA



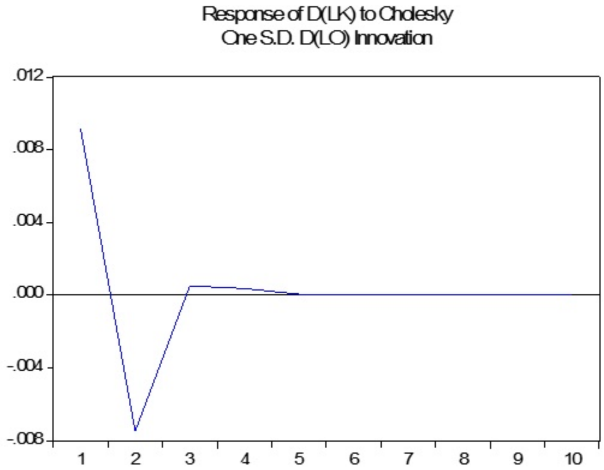
ISRAEL



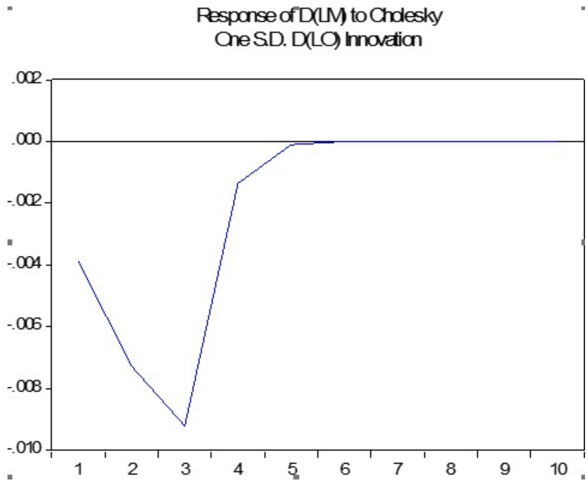
JAPAN



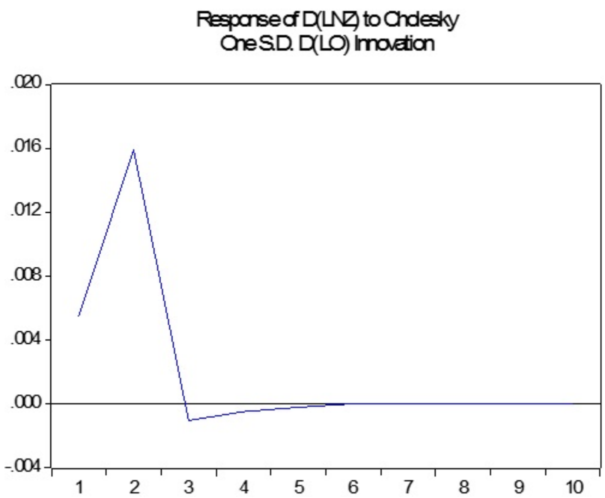
KOREA



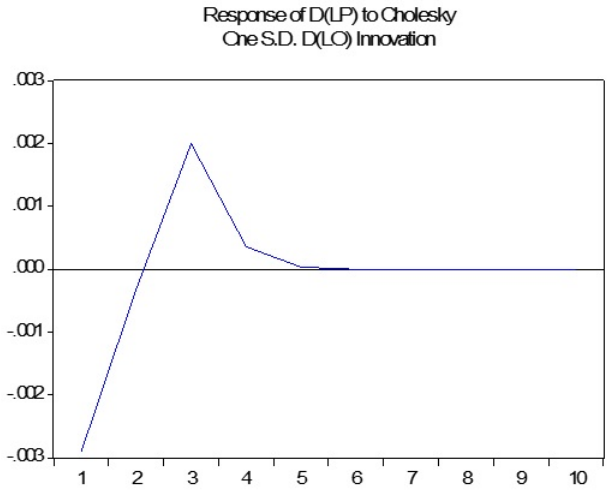
MALAYSIA



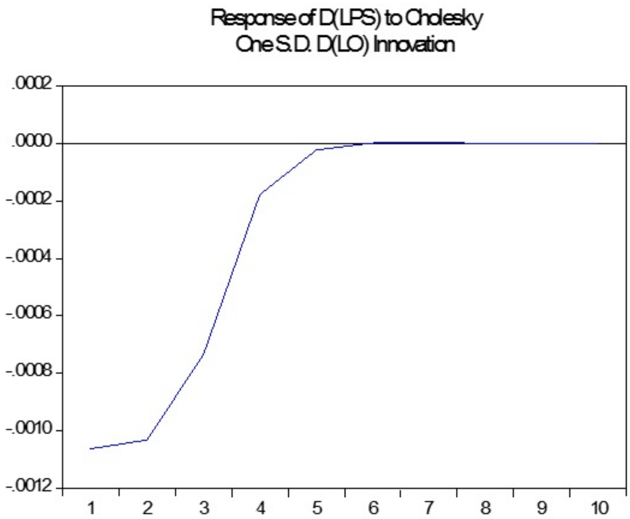
NEW ZEALAND



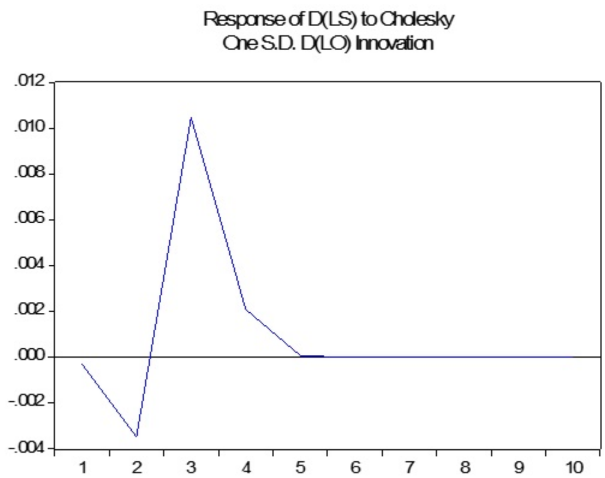
PAKISTAN



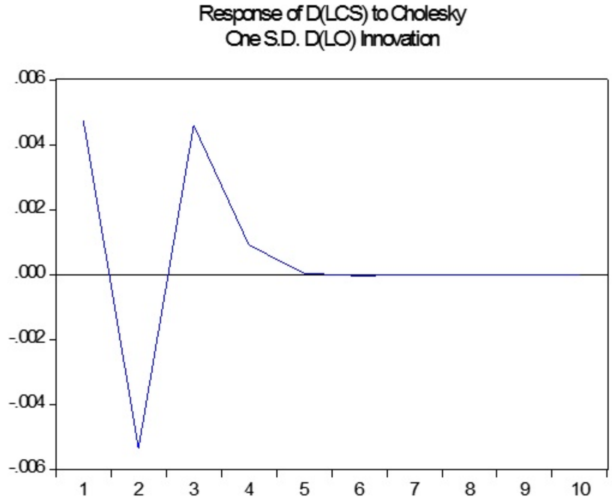
PHILIPPINE



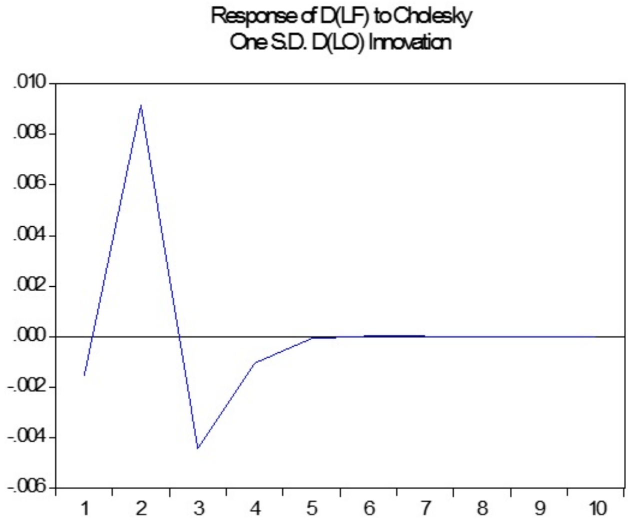
SAUDI ARABIA



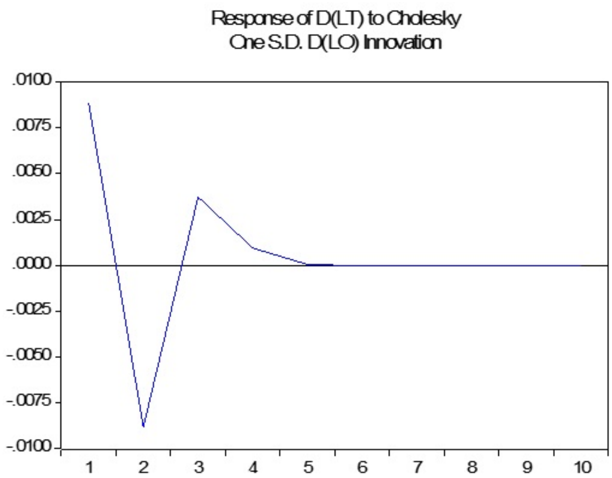
SRI LANKA



SINGAPORE



TAIWAN



The figures show that 1 standard deviation change in oil market results in decrease in Australian equity return from period/day 1 to period/day 2 and starts increasing from day 4 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market. Variation of 1 standard deviation in oil market causes decrease in China equity market return. Variation of 1 standard deviation in oil market causes decrease in India equity market return from period/day 1 to period/day 2 and starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market.

Fluctuation in oil market of one standard deviation results in decrease in Indonesia equity market return from period/day 1 to period/day 2 and starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market. Change in oil market of one standard deviation results in decrease in Israel equity market return from period/day 1 to period/day 2 and starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market.

Change in oil market of one standard deviation results in increase in Japanese equity market return from period/day 1 to period/day 2 and faces slightly fluctuation in period 2 then again starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market. Change in oil market of one standard deviation results in increase in Korean equity market return from period/day 1 to period/day 2 and faces slightly fluctuation in period 2 then again starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market. In oil market 1 standard deviation variation results in decrease in equity returns of Malaysia. In New Zealand,1 standard deviation change in oil market results in increase in equity returns.

Variation of 1 standard deviation in oil market causes decrease in Pakistan equity market return from period/day 1 to period/day 2 and starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market. In Philippine,1 standard deviation change in oil market results in decrease in equity returns. Change in oil market of one standard deviation results in decrease in Saudi equity market return from period/day 1 to period/day 2 and starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market. Change in oil market of one standard deviation results in increase in Singapore equity market return from period/day 1 to period/day 2 and faces slightly fluctuation in period 2 then again starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to change in oil market.

Fluctuation in oil market of one standard deviation results in increase in Sri Lanka equity market return from period/day 1 to period/day 2 and faces slightly fluctuation in period 2 then again starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market. Variation in oil market of one standard deviation results in increase in Taiwan equity market return from period/day 1 to period/day 2 and faces slightly fluctuation in period 2 then again starts increasing from day 3 to day 5. From period/day 5 and onward change has been removed and equity market not responds to variation in oil market.

4.2.2 Variance Decomposition Analysis

The table 4.4 shows that there is 99% variance in oil market is due to stock market and 9% variance in Australia equity market and 12% in China equity market is due to oil market. However, Variation of 34% in Indian equity market is due to oil market. Oil market causes 72% variation in Indonesian equity market. Israel equity market bears 9% variation due to oil prices. While, there is 11% variation in Japanese stock market due to oil prices. In Korean equity market there is 55% variation. 11% changes in New Zealand equity market, 10% in Pakistan equity market results due to variation in oil market. Oil market causes 14%, 50%, 60%, 42%, 31% and 33% variation in Philippine, Saudi Arabia, Singapore, Sri- Lanka, Malaysia and Taiwan respectively.

Table 4.4: Variance Decomposition Analysis

Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
SE	0.0403	0.0409	0.0409	0.0409	0.0409	0.0409	0.0409	0.0409	0.0409	0.0409
WTI	100.00	99.997	99.912	99.908	99.908	99.908	99.908	99.908	99.908	99.908
AXJO	0.0000	0.0024	0.0882	0.0912	0.0912	0.0912	0.0912	0.0912	0.0912	0.0912
HSI	0.0000	0.0637	1.2492	1.2996	1.2997	1.2997	1.2997	1.2997	1.2997	1.2997
BSE	0.0000	0.0704	0.3363	0.3411	0.3412	0.3412	0.3412	0.3412	0.3412	0.3412
JKSE	0.0000	0.0109	0.7163	0.7274	0.7275	0.7275	0.7275	0.7275	0.7275	0.7275
TA125	0.0000	0.0048	0.0914	0.0946	0.0946	0.0946	0.0946	0.0946	0.0946	0.0946
N225	0.0000	0.0562	1.0695	1.1279	1.1280	1.1280	1.1280	1.1280	1.1280	1.1280
KS11	0.0000	0.0137	0.5411	0.5588	0.5588	0.5588	0.5588	0.5588	0.5588	0.5588
KLSE	0.0000	0.2580	0.3121	0.3138	0.3139	0.3139	0.3139	0.3139	0.3139	0.3139
NZ50	0.0000	0.2613	1.1329	1.1599	1.1603	1.1604	1.1604	1.1604	1.1604	1.1604
KSE	0.0000	0.0567	0.1008	0.1025	0.1025	0.1025	0.1025	0.1025	0.1025	0.1025
PSESI	0.0000	0.3728	1.3837	1.4835	1.4867	1.4867	1.4867	1.4867	1.4867	1.4867
TASI	0.0000	0.2995	0.5022	0.5071	0.5071	0.5071	0.5071	0.5071	0.5071	0.5071
FTSEST	0.0000	0.5971	0.6035	0.6035	0.6035	0.6035	0.6035	0.6035	0.6035	0.6035
CSE	0.0000	0.0210	0.4143	0.4262	0.4262	0.4262	0.4262	0.4262	0.4262	0.4262
TWII	0.0000	0.0005	0.3211	0.3309	0.3309	0.3309	0.3309	0.3309	0.3309	0.3309

4.3 Mean and Volatility Spillover from the Oil Market to Equity Market

ARMA-GARCH model is divided into two stages. In first stage oil price shocks are calculated and in second stage these shocks are placed into equity market. As these are discussed in methodology:

The table 4.5 shows the results of ARMA-GARCH Model. In AXJO (Australian stock market) β_1 shows that Australian equity market is inefficient and there is a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns can be forecasted. β_3 depicts that on past price shocks Australian equity market make corrections on next day. Australian market moves oppositely so that it adjusts the negative returns on next day. ω shows that from oil market mean spillover transfers to equity market and there is the oil market impact on Australian equity market. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Australian market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Australian equity market.

In HSI (China stock market) β_1 shows that Chinese equity market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Chinese equity market make corrections on next day. Chinese equity market moves oppositely so it adjusts the negative returns on next day.ω shows that from oil market mean spillover transfers to equity market and there is the oil market impact on Chinese equity market. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Chinese market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Chinese equity market.

Table 4.5: ARMA-GARCH Model

	WTI	**AXJO**	**HSI**	**BSE**	**JKSE**	**TA125**	**N225**	**KS11**
β_0	3.7E-06	-0.0001	0.0004	-0.0210	0.0002	-4.42E-05	0.0008	-0.0002
	(0.9910)	(0.0000)	(0.0675)	(0.5631)	(0.0769)	(0.0036)	(0.9367)	(0.0356)
β_1	3.9649	-0.5876	0.1180	0.0588	0.1649	-0.2627	0.3920	0.0900
	(0.0141)	(0.0201)	(0.6303)	(0.1116)	(0.0003)	(0.0827)	(0.9589)	(0.4401)
β_2	-2.1735	14.5808	1.3727	-0.0112	2.6224	9.4708	-	3.1536
	(0.1098)	(0.0000)	(0.2276)	(0.2479)	(0.0386)	(0.0000)	-	(0.0133)
β_3	-3.9728	0.6168	-0.0710	-0.8103	-0.0381	0.3145	-0.3935	0.1362
	(0.0139)	(0.0147)	(0.7725)	(0.0000)	(0.4088)	(0.0379)	(0.9588)	(0.2444)
ω	-	0.0001	0.0004	0.0006	0.0000	0.0001	0.0001	0.0007
	-	(0.0000)	(0.0001)	(0.9132)	(0.6834)	(0.0000)	(0.8893)	(0.0000)
γ_0	3.6E-06	-3.01E-10	9.2E-07	0.0063	0.0000	-8.7E-10	-	0.0000
	(0.0000)	(0.0275)	(0.0003)	(0.0000)	(0.0000)	(0.0000)	-	(0.0000)
γ_1	0.0645	0.2083	0.0741	0.0403	0.1509	0.0716	-	0.1837
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	-	(0.0000)
γ_2	0.9307	0.8118	0.9158	0.8652	0.6005	0.9177	-	0.6246
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	-	(0.0000)
ϕ	-	6.66E-13	4.65E-10	-2.85E-07	-3.57E-10	5.6E-12	-	-2.34E-10
	-	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	-	(0.0000)

Values in parenthesis are the p-values. ω *= Mean Spillover and* ϕ *= Volatility Spillover*

In BSE (Indian stock market) β_1 shows that Indian equity market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Indian equity market make corrections on next day. Indian equity market moves inefficiently so it adjusts the negative returns on next day. ω shows that mean spillover does not exist. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Indian market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Indian equity market.

In JKSE (Indonesian stock market) β_1 shows that Indonesian equity market is inefficient and there is a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns can be forecasted. β_3 depicts that on past price shocks Indonesian equity market cannot make corrections on next day. Indonesian equity market moves inefficiently so it does not adjust the negative returns on next day. ω shows that mean spillover does not exist.γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Indonesian market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Indonesian equity market.

In TA125 (Israel stock market) β_1 shows that Israel equity market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns can be forecasted. β_3 depicts that on past price shocks Israel equity market make corrections on next day. Israel market moves oppositely so that it adjusts the negative returns on next day. ω shows that from oil market mean spillover transfers to equity market and there is the oil market impact on Israel equity market. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Israel market.γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Israel equity market.

In N225 (Japanese stock market) β_1 shows that Japanese equity market is efficient and there is not a connection among past and present equity returns. β_3 depicts that on past price shocks Japanese equity market cannot make corrections on next day. ω shows that mean spillover does not exist.

In KS11 (Korean stock market) β_1 shows that Korean equity market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns can be forecasted. β_3 depicts that on past price shocks Korean equity market cannot make corrections on next day. Korean equity market moves inefficiently so it does not adjust the negative returns on next day. ω shows that mean spillover does exist. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Korean market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Korean equity market.

In CSE (Columbo stock exchange) β_1 shows that Sri Lanka stock market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Sri Lanka equity market cannot make corrections on next day. ω shows that from oil market mean spillover transfers to equity market and there is the oil market impact on Sri Lanka equity market. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of C Sri Lanka market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Sri Lanka equity market.

In KLSE (Kuala Lampur stock exchange) β_1 shows that Malaysian stock market is inefficient and there is a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Malaysian equity market cannot make corrections on next day. ω shows that mean spillover exists.

Table 4.6: ARMA-GARCH Model

	CSE	KLSE	NZ50	KSE	PSESI	TASI	FTSEST	TWII
β_0	0.0001	0.0001	0.0002	-0.0003	0.0003	-0.0001	-3.77E-05	0.0002
	(0.9290)	(0.1991)	(0.5937)	(0.0000)	(0.8204)	(0.8870)	(0.9183)	(0.2565)
β_1	0.0303	0.1262	-0.3407	0.1617	0.0527	0.4651	0.7532	-0.0656
	(0.7655)	(0.0333)	(0.3353)	(0.0000)	(0.7843)	(0.2002)	(0.0096)	(0.4260)
β_2	2.2863	1.2053	-1.6473	-3.6703	-0.5397	0.5909	0.5914	8.5667
	(0.4807)	(0.2274)	(0.7936)	(0.0000)	(0.8674)	(0.8641)	(0.8524)	(0.0022)
β_3	0.1646	-0.0190	0.4047	-0.0564	0.1080	-0.4064	-0.6980	0.1023
	(0.1358)	(0.7470)	(0.2538)	(0.1188)	(0.5843)	(0.2674)	(0.0154)	(0.2177)
ω	-2.52E-05	0.0001	0.0002	0.0001	0.0002	0.0004	0.0006	0.0001
	(0.9254)	(0.0004)	(0.0260)	(0.0000)	(0.4619)	(0.1523)	(0.0001)	(0.0062)
γ_0	7.49E-05	0.0000	0.0000	6.04E-07	0.0001	0.0001	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
γ_1	0.1500	0.2355	0.1500	0.2373	0.1500	0.1500	0.1500	0.1502
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
γ_2	0.6000	0.6165	0.6000	0.6647	0.6000	0.6000	0.6000	0.6001
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ϕ	-1.26E-09	-1.38E-10	-3.65E-10	-1.18E-11	-2.99E-09	-6.22E-10	-4.32E-10	-2.95E-10
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Values in parenthesis are the p-values. ω = *Mean Spillover and* ϕ = *Volatility Spillover.*

γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Malaysian market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Malaysian equity market.

In NZ50 (New Zealand stock exchange) β_1 shows that New Zealand stock market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks New Zealand equity market cannot make corrections on next day. ω shows that mean spillover exists. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of New Zealand market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to New Zealand equity market.

In KSE (Karachi stock exchange) β_1 shows that Pakistan stock market is inefficient and there is a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns can be forecasted. β_3 depicts that on past price shocks Pakistan equity market cannot make corrections on next day. ω shows that mean spillover exists. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Pakistan market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Pakistan equity market.

In KSE (Karachi stock exchange) β_1 shows that Pakistan stock market is inefficient and there is a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns can be forecasted. β_3 depicts that on past price shocks Pakistan equity market cannot make corrections on next day. ω shows that mean spillover exists. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Pakistan market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Pakistan equity market.

In PSE (Philippine stock exchange) β_1 shows that Philippine stock market is inefficient and there is a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Philippine equity market can make corrections on next day. ω shows that mean spillover does not exist. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Philippine market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Philippine equity market.

In TASI (Tadawul All Share Index) β_1 shows that Saudi stock market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Saudi equity market cannot make corrections on next day. ω shows that mean spillover does not exists. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Saudi market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Saudi equity market.

In TASI (Tadawul All Share Index) β_1 shows that Saudi stock market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Saudi equity market cannot make corrections on next day. ω shows that mean spillover does not exist. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Saudi market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. shows the existence of volatility spillover and oil price shocks transfers to Saudi equity market.

In FTSEST (Singapore stock exchange) β_1 shows that Singapore stock market is inefficient and there is a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns cannot be forecasted. β_3 depicts that on past price shocks Singapore equity market can make corrections on next day. ω shows that mean spillover exists. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Singapore market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Singapore equity market.

In TWII (Taiwan stock exchange) β_1 shows that Taiwan stock market is efficient and there is not a connection among past and present equity returns. β_2 shows that through forecasted volatility future returns can be forecasted. β_3 depicts that on past price shocks Taiwan equity market cannot make corrections on next day. ω shows that mean spillover exists. γ_1 shows the ARCH effect and denotes that past price behavior can be used to predict the future returns of Taiwan market. γ_2 shows the GARCH effect and depicts that there is a persistence of volatility. ϕ shows the existence of volatility spillover and oil price shocks transfers to Taiwan equity market.

The above results show that β_1 significant value shows that stock market is inefficient and there is a connection among past and present equity returns of Australia, Indonesia, Malaysia, Pakistan and Singapore. β_1 insignificant value shows that there is no connection among past and present equity returns of China, India, Israel, Japan, Korea, New Zealand, Philippine, Saudi Arabia, Srilanka and Taiwan. Forecasted conditional volatility can be used for forecasting the returns of equity markets of Australia, Indonesia, Israel, Korea, Pakistan and Taiwan. Where volatility cannot be forecast returns of China, India, Singapore, Malaysia, New Zealand, Philippine, Saudi Arabia and Srilanka. β_3 significant value depicts that on past price shocks equity market make corrections on next day and equity market moves oppositely to adjusts the negative returns on next day in Australia, India, Israel and Singapore. Past price shocks do not the returns on next day in China, New Zealand, Indonesia, Korea, Srilanka, Malaysia, New Zealand, Philippine, Saudi Arabia, Pakistan and Taiwan. ARCH effect shows that past price behavior can be used to predict the future volatility of Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Srilanka, Malaysia, New Zealand, Philippine, Saudi Arabia, Pakistan and Taiwan equity market. GARCH effect depicts persistence of volatility in Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Srilanka, Malaysia, New Zealand, Philippine, Saudi Arabia, Pakistan and Taiwan equity market. From oil market mean spillover transfers to equity market of Australia, China, Israel, Korea, Malaysia, New Zealand, Pakistan, Singapore and Taiwan. The results indicate the absence of transmission of mean spillover from oil market to equity market of India, Indonesia, japan, Srilanka, Philippine and Saudi Arabia. Whereas finds the volatility spillover from oil price to equity return of AXJO, HSI, BSE, JKSE, TA125, N225, KS11, KLSE, NZ50, KSE100, PSESI, TASI, FTSEST, CSE and TWII.

4.4 DCC-GARCH Model

DCC-GARCH model identifies the time-varying conditional correlation of oil price with equity return.

The table-4.7 exhibits the result of DCC-GARCH Model. Minimum AIC (Akaike info criterion) has been used to identify which model (GARCH, E-GARCH, TARCH) has to be applied. In AXJO (Australian stock exchange) E-GARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock does not exists and through past correlation current correlation cannot be predicted. θ_2 shows that relationship between lag and current correlation exists. In HSI (Hang Seng Index) GJR-TARCH model has been applied as according to minimum AIC in which θ_1 shows that past price shock exists and through past correlation current correlation can be predicted. θ_2 shows that relationship between lag and current correlation exists in China equity market. In JKSE (Jakarta stock exchange) E-GARCH model has been applied as according to minimum AIC in which θ_1 shows that past price shock does not exists and through past correlation current correlation cannot be predicted. θ_2 shows that relationship between lag and current correlation exists in Indonesian equity market. In KS11 (Korean stock exchange) E-GARCH model has been applied as according to minimum AIC in which θ_1 shows that past price shock does not exists and through past correlation current correlation cannot be predicted. θ_2 shows that relationship between

Table 4.7: DCC-GARCH Model

Series	θ_1	θ_2
Australia	0.00677	0.97800
	(0.0518)	(0.0000)
China	0.03753	0.81812
	(0.0003)	(0.0000)
Indonesis	0.00576	0.68504
	(0.4628)	(0.0464)
Korea	0.02501	0.74028
	(0.0572)	(0.0001)
Malaysia	0.00149	0.99777
	(0.0483)	(0.0000)
New Zealand	-0.00432	0.47236
	(0.5306)	(0.4329)
Pakistan	0.00708	0.51883
	(0.5639)	(0.2646)
Philippine	0.01281	0.39127
	(0.1147)	(0.1965)
Saudi Arabia	0.00539	0.98972
	(0.0736)	(0.0000)
Singapore	0.01214	0.98462
	(0.0027)	(0.9968)
Taiwan	-	-
Sri Lanka	-	-
India	-	-
Israel	-	-
Japan	-	-

θ_1 *exhibits dynamic correlation,* θ_2 *exhibits time-varying correlation* lag and current correlation exists. In KLSE (Kuala Lampur stock exchange) E-GARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock exists and through past correlation current correlation can be predicted. θ_2 shows that relationship between lag and current correlation exists in Malaysian equity market.

In NZ50 (New Zealand stock exchange) E-GARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock does not exists and through past correlation current correlation cannot be predicted. θ_2 shows that relationship between lag and current correlation does not exists in New Zealand equity market. In KSE (Karachi stock exchange) E-GARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock does not exists and through past correlation current correlation cannot be predicted. θ_2 shows that relationship between lag and current correlation does not exists in Pakistan equity market. In PSESI (Philippine stock exchange) E-GARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock does not exists and through past correlation current correlation cannot be predicted. θ_2 shows that relationship between lag and current correlation does not exists in Philippine equity market.

In TASI (Tadabul All Share Index) GJR-TARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock does not exists and through past correlation current correlation cannot be predicted. θ_2 shows that relationship between lag and current correlation exists in Saudi equity market. In FTSEST (Singapore stock market) E-GARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock exists and through past correlation current correlation can be predicted. θ_2 shows that relationship between lag and current correlation exists in Singapore equity market. In TWII (Taiwan stock market) E-GARCH model has been applied according to minimum AIC in which θ_1 shows that past price shock exists and through past correlation current correlation can be predicted. θ_2 shows that relationship between lag and current correlation exists in Taiwan equity market. However, there is no correlation exists in India, Israel, Japan and Sri Lanka stock markets as according to minimum AIC identified model.

The above results show that E-GARCH model is applied on AXJO, JKSE, KS11, KLSE, NZ50, KSE, PSESI, FTSEST and TWII whereas GJR-TARCH model is applied on HSI, and TASI in accordance with the minimum AIC identified. However, the results indicate the absence of dynamic conditional correlation in India, Israel, Japan and Sri Lanka stock markets. θ_1 insignificant value shows that past price shock does not exists and through past correlation current correlation cannot be predicted in AXJO, JKSE, KS11, KLSE, NZ50, KSE, PSESI and TASI. θ_1 significant value shows that past price shock exists and through past correlation current correlation can be predicted in FTSEST, TWII and HSI. θ_2 significant value shows that relationship between lag and current correlation exists in equity market of AXJO, HSI, KS11, KLSE, TASI, FTSEST and TWII. θ_2 insignificant value shows that relationship between lag and current correlation does not exist in equity market of JKSE, NZ50, KSE, CSE and PSESI.

4.5 Oil Price Asymmetric Effect on the Equity Return

The linear model table- 4.8 shows the oil price asymmetric effect on equity returns in long run. In AXJO, WTI^+ significant value shows that positive shock in oil price causes 2.7% rise in equity returns. WTI^+(-1) significant value shows that after 1 lag positive shock in oil price causes 3.27% rise in equity returns. WTI^+(-2) significant value shows that after 2 positive shock in oil price causes 6.05% depletion in equity returns. WTI^- significant value shows that negative shock in oil price causes 4.9% rise in equity returns. WTI^-(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^-(-2) significant value shows that after 2 lags negative shock in oil price results in 5.6% decrease in equity returns.

In HSI, WTI^+ significant value shows that positive shock in oil price causes 16.24% rise in equity returns. WTI^+(-1) insignificant value shows that after 1 lag positive shock in oil price not causes any influence the equity return. WTI^{+}(-2) significant value shows that after 2 lags positive shock in oil price causes 11.79% depletion in equity returns. WTI^{+}(-3) insignificant value shows that after 3 lags positive oil price shocks has no influence on equity returns. WTI^{-} significant value shows that negative oil price shock results in 42% increase in equity returns. WTI^{-}(-1) significant value shows that after 1 lag negative oil price shock results in 18% decrease in equity returns. The significant value of WTI^{-}(-2) shows that after 2 lags negative oil price shock results in 23% decrease in equity returns.

In BSE, WTI^{+} significant value shows that positive shock in oil price causes 40.2% decrease in equity returns. WTI^{+}(-1) significant value shows that after 1 lag positive shock in oil price causes 53.8% increase in equity returns. WTI^{+} (-2) insignificant value shows that after 2 lags positive oil price shocks has no influence on equity return. WTI^{+}(-3) insignificant value shows that after 3 lags positive shock in oil price not influence the equity return.

WTI^{+}(-4) significant value shows that after 4 lag positive shock in oil price causes 26.5% depletion in equity returns. WTI^{-} significant value shows that negative oil price shock results in 32.9% increase in equity returns. WTI^{-}(-1) significant value shows that after 1 lag negative shock in oil price causes 33.6% decrease in equity returns. WTI^{-}(-2) insignificant value shows that after 2 lags negative shock in oil prices has no influence on equity returns. WTI^{-}(-3) insignificant value shows that after 3 lags negative shock in oil price causes has no influence on equity returns. WTI^{-}(-4) significant value shows that after 4 lags negative shock in oil price results in 21.2% increase in equity returns. In JKSE, WTI^{+} significant value shows that positive shock in oil price causes 2.21% rise in equity returns.

WTI^{+}(-1) insignificant value shows that after 1 lag positive shock in oil price not influences the equity return. WTI^{+}(-2) insignificant value shows that after 2 lags positive oil price shock does not influence the equity return. WTI^{+}(-3) insignificant value shows that after 3 lags positive shock in oil price not influences the equity return.

Table 4.8: Linear ARDL Model

Variables	AXJO	HIS	BSE	JKSE	TA125	N225	KS11
WTI^{+}	2.7692	16.2404	-402.9725	2.2149	0.5536	-0.1366	1.1356
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.3122)	(0.0003)
WTI^{+}**(-1)**	3.2713	1.4089	538.2120	-0.3763	-0.5066	–	-0.0547
	(0.0025)	(0.8231)	(0.0000)	(0.6343)	(0.0045)	–	(0.9077)
WTI^{+}**(-2)**	-6.0524	-11.7904	6.8801	-0.9469	0.2737	–	-0.4721
	(0.0000)	(0.0479)	(0.9501)	(0.2317)	(0.1139)	–	(0.2898)
WTI^{+}**(-3)**	–	-5.6738	122.9919	-0.8776	-0.3174	–	-0.5966
	–	(0.1553)	(0.2634)	(0.1046)	(0.0078)	–	(0.0452)
WTI^{+}**(-4)**	–	–	265.1208	–	–	–	–
	–	–	(0.0004)	–	–	–	–
WTI^{-}	4.9184	42.1633	329.5086	3.1412	1.2833	12.8289	2.5421
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0004)	(0.0000)
WTI^{-}**(-1)**	0.6798	-18.1402	-336.0674	0.1484	-1.1127	1.4609	-0.8652
	(0.5146)	(0.0029)	(0.0015)	(0.8458)	(0.0000)	(0.7829)	(0.0572)
WTI^{-}**(-2)**	-5.6118	-23.8606	-130.5280	-3.4490	-0.1679	-14.4374	-1.6666
	(0.0000)	(0.0000)	(0.2172)	(0.0000)	(0.1552)	(0.0001)	(0.0000)
WTI^{-}**(-3)**	–	–	-80.0386	1.3513	–	–	–
	–	–	(0.4489)	(0.0601)	–	–	–
WTI^{-}**(-4)**	–	–	212.6042	-1.1885	–	–	–
	–	–	(0.0025)	(0.0128)	–	–	–

WTI^{+} = Positive oil price shock, WTI^{-} = Negative oil price shock, (-1), (-2),(-3), (-4) are lags

WTI^{-} significant value shows that negative oil price shock results in 3.14% increase in equity returns. WTI^{-}(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. The significant value of WTI^{-}(-2) shows that after 2 lags negative shock in oil prices results in 3.44% decrease in equity returns. WTI^{-}(-3) insignificant value shows that after 3 lags negative oil price shock does not influence the equity return. WTI^{-}(-4) significant value shows that after 4 lags negative shock in oil price causes 1.18% depletion in equity return.

In TA125, WTI^{+} significant value shows that positive shock in oil price causes 0.55% rise in equity returns. WTI^{+}(-1) significant value shows that after 1 lag positive shock in oil price causes 0.50% depletion in equity returns. WTI^{+}(-2) insignificant value shows that after 2 lag positive shock in oil price not influences the equity return. The significant value positive oil price shock of WTI^{+}(-3) shows that after 3 lags positive oil price shocks result in 0.31% decrease in equity returns. WTI^{-} significant value shows that negative oil price shock results in 1.28% increase in equity returns. WTI^{-}(-1) significant value shows that after 1 lag negative oil price shock results in 1.11% decrease in equity returns. WTI^{-}(-2) insignificant value shows that after 2 lags negative shock in oil price not influences the equity return.

In N225, WTI^{-} significant value shows that negative shock in oil price causes 12.82% rise in equity returns. WTI^{-}(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^{-}(-2) significant value shows that after 2 lags negative shock in oil price results in 14.43% decrease in equity returns.

In KS11, WTI^{+} significant value shows that positive shock in oil price causes 1.13% rise in equity returns. WTI^{+}(-1) insignificant value shows that after 1 lag positive shock in oil price not influences the equity return. WTI^{+}(-2) insignificant value shows that after 2 lags positive oil price shocks does not influence the equity return. WTI^{+}(-3) significant value shows that after 3 lags positive oil price shocks result in 0.59% decrease in equity returns. WTI^{-} significant value shows that negative shock in oil prices causes rise in equity returns. WTI^{-}(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^-(-2) significant value shows that after 2 lags negative shock in oil price causes decrease in equity returns.

In KLSE, WTI^+ insignificant value shows that after 1 lag positive shock in oil price not influences the equity return. WTI^+(-1) significant value shows that positive shock in oil price causes 1.07% rise in equity returns. WTI^+(-2) significant value shows that after 2 lags positive oil price shocks result in 1.11% decrease in equity returns. WTI^- significant value shows that negative shock in oil price causes 1.04% rise in equity returns. WTI^-(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^-(-2) insignificant value shows that after 2 lags negative shock in oil price not influences the equity return.

In NZ50, WTI^+ significant value exhibits that positive shock in oil price causes 1.22% rise in equity returns. WTI^+(-1) insignificant value shows that after 1 lag positive shock in oil price not influences on equity returns. WTI^+(-2) significant value shows that after 2 lags positive shock in oil price causes decrease in equity returns. WTI^- significant value shows that negative shock in oil prices results in increase in equity returns. WTI^-(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^-(-2) significant value shows that after 2 lags negative shock in oil price causes decrease in equity returns.

In KSE, WTI^+ insignificant value exhibits that positive shock in oil price not influences the equity return. WTI^+(-1) insignificant value shows that after 1 lag positive shock in oil price not influences the equity return. WTI^+(-2) insignificant value shows that after 2 lags positive shock in oil price not influences the equity return. WTI^+(-3) significant value shows that after 3 lags positive shock in oil price causes 13.12% depletion in equity returns. WTI^+(-4) significant value shows that after 4 lags positive shock in oil price causes 6.97% rise in equity returns. WTI^- insignificant value shows that negative shock in oil price not influences the equity return. WTI^-(-1) insignificant value shows that after 1 lag negative shock in oil price not influences the equity return. WTI^-(-2) significant value shows that after 2 lags negative shock in oil price causes 9.74% depletion in equity return.

In PSESI, WTI^+ insignificant value shows that positive shock in oil price not influences the equity return. WTI^+(-1) significant value shows that after 1 lag positive oil price shocks results in 3.75% increase in equity returns. WTI^+(-2) insignificant value shows that after 2 lags positive shock in oil price not effects equity return. WTI^+(-3) significant value shows that after 3 lags positive oil price shocks result in 0.017% decrease in equity returns. WTI^- significant value shows that negative shock in oil price causes 2.8% rise in equity returns. WTI^-(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^-(-2) significant value shows that after 2 lags negative oil price shock results in 5.29% decrease in equity returns. WTI^-(-3) significant value shows that after 3 lags negative oil price shock results in 2.48% decrease in equity returns. WTI^-(-4) insignificant value shows that after 4 lags negative oil price shock does not influence the equity return.

In TASI, WTI^+ insignificant value exhibits that positive shock in oil price not influences the equity return. WTI^+(-1) insignificant value shows that after 1 lag positive shock in oil price not influences the equity return. WTI^+(-2) significant value exhibits that after 2 lags positive oil price shocks result in 6.12% decrease in equity returns. WTI^+(-3) insignificant value shows that after 3 lags positive shock in oil price not influences the equity return. WTI^- significant value shows that negative shock in oil price causes 7.22% increase in equity returns. WTI^-(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^+(-2) significant value shows that after 2 lags negative shock in oil prices results in 5.4% decrease in equity returns.

In FTSEST, WTI^+ significant value shows that positive oil price shocks result in 0.02% increase in equity returns. WTI^- significant value shows that negative shock in oil prices results in 0.63% increase in equity returns. WTI^-(-1) insignificant value shows that after 1 lag oil price shock does not influence the equity return.

TABLE 4.9: Linear ARDL Model

Variables	**KLSE**	**NZ50**	**KSE**	**PSESI**	**TASI**	**FTSEST**	**CSE**	**TWII**
WTI^{+}	0.0453	1.2295	3.2773	-0.0766	1.3218	0.0215	0.7681	3.1237
	(0.8683)	(0.0260)	(0.2927)	(0.9223)	(0.4564)	(0.0009)	(0.1155)	(0.1825)
WTI^{+}**(-1)**	1.0722	0.1322	-3.1022	3.7511	4.9943	_	-0.7326	1.5114
	(0.0090)	(0.8735)	(0.5052)	(0.0012)	(0.0571)	_	(0.1362)	(0.6677)
WTI^{+}**(-2)**	-1.1157	-1.3875	5.8702	-1.8104	-6.1231	_	_	-4.6458
	(0.0001)	(0.0128)	(0.1820)	(0.1191)	(0.0006)	_	_	(0.0495)
WTI^{+}**(-3)**	_	_	-13.1223	-1.8790	_	_	_	_
	_	_	(0.0016)	(0.0177)	_	_	_	_
WTI^{+}**(-4)**	_	_	6.9743	_	_	_	_	_
	_	_	(0.0172)	_	_	_	_	_
WTI^{-}	1.0471	1.8657	1.9049	2.8080	7.2251	0.6385	-0.0303	9.2032
	(0.0001)	(0.0004)	(0.5239)	(0.0002)	(0.0000)	(0.0002)	(0.9479)	(0.0000)
WTI^{-}**(-1)**	-0.6650	0.6617	7.7117	1.2931	-1.6183	-0.1715	1.3243	-1.1437
	(0.0924)	(0.4079)	(0.0862)	(0.2476)	(0.5280)	(0.4883)	(0.0449)	(0.7361)
WTI^{-}**(-2)**	-0.3813	-2.5565	-9.7455	-5.2986	-5.4198	-0.1460	-1.2311	-8.0770
	(0.1423)	(0.0000)	(0.0011)	(0.0000)	(0.0014)	(0.5551)	(0.0491)	(0.0003)
WTI^{-}**(-3)**	_	_	_	2.4821	_	-0.7483	0.9602	_
	_	_	_	(0.0183)	_	(0.0025)	(0.1249)	_
WTI^{-}**(-4)**	_	_	_	-1.3048	_	0.4476	-0.9902	_
	_	_	_	(0.0604)	_	(0.0085)	(0.0220)	_

WTI^{+}= *Positive oil price shock,* WTI^{-} = *Negative oil price shock,(-1),(-2),(-3),(-4) are lag values*

WTI^-(-2) insignificant value shows that after 2 lags negative oil price shock does not influence the equity return. WTI^-(-3) significant value shows that after 3 lags negative shock in oil prices results in 0.74% decrease in equity returns. WTI^-(-4) significant value shows that after 4 lags negative shock in oil prices results has 0.44% positive impact on equity returns.

In CSE, WTI^+ insignificant value shows that positive oil price shock does not influence the equity return. WTI^+(-1) insignificant value shows that after 1 lag positive oil price shock does not influence the equity return. WTI^- insignificant value shows that negative oil price shock does not influence the equity return. WTI^-(-1) significant value shows that after 1 lag negative shock in oil price has 1.32% positive impact on equity return. WTI^-(-2) significant value shows that after 2 lags negative shock in oil prices results in 1.23% decrease in equity returns. WTI^-(-3) insignificant value shows that after 3 lags negative oil price shock does not influence the equity return. WTI^-(-4) significant value shows that after 4 lags negative shock in oil price results in 0.99% decrease in equity returns.

In TWII, WTI^+ insignificant value shows that positive oil price shock does not influence the equity return. WTI^+(-1) insignificant value shows that after 1 lag positive oil price shock does not influence the equity return. WTI^- significant value shows that negative shock in oil price results in 9.20% increase in equity returns. WTI^-(-1) insignificant value shows that after 1 lag negative oil price shock does not influence the equity return. WTI^-(-2) significant value shows that after 2 lags negative oil price shock results in 8.07% decrease in equity return.

The above results show that positive oil price shock exists up to 2 lags in AXJO, HSI, KLSE, NZ50, TWII and negative oil price shocks exists up to 2 lags in AXJO, HSI, JKSE, N225, KS11, TASI, NZ50, KSE, TASI and TWII. Positive oil price shock does not exist in HSI, KS11, JKSE, N225 and CSE. Positive oil price shock exists up to 1 lag in BSE, FTSEST and negative oil price shocks exists up to 1 lag in BSE and TA125. Positive oil price shock exists up to 3 lags in TA125 and PSESI. Negative oil price shock exists up to 4 lags in PSESI, FTSEST and CSE.

4.5.1 Linear ARDL Model

The table 4.10 reports the results of short run connection of oil market with equity return. The table shows the oil price asymmetric impact on equity return in short run. In AXJO, ΔWTI^{+} shows that 1% variation in positive oil price shock causes 2.7% increase in equity returns.ΔWTI^{+}(-1) exhibits that after 1 lag 1% variation in positive oil price shocks result in 6.5% increase in equity returns. ΔWTI^{-} shows that variation of 1% in negative oil price shock causes 4.9% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in negative oil price shock causes 5.6% increase in equity returns.

In HSI, ΔWTI^{+} shows that variation of 1% in positive oil price shock causes 16.2% increase in equity returns. ΔWTI^{+}(-1) shows that after 1 lag variation of 1%in positive oil price shock causes 17.4% increase in equity returns. ΔWTI^{-} exhibits that variation of 1% in negative oil price shock causes 42% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lag variation of 1% in negative shock in oil price results in 23% increase in equity returns.

In BSE, ΔWTI^{+} shows that variation of 1% in positive oil price shock causes 40.2% decrease in equity returns. ΔWTI^{+}(-1) and ΔWTI^{+}(-2) exhibits that after 2 lags positive oil price shock does not influence the equity return. ΔWTI^{+}(-3) depicts that after 3 lags 1% variation in positive oil price shock results in 26.5% increase in equity returns. ΔWTI^{-} shows that 1% variation in negative oil price shock results in 32.9% increase in equity returns. ΔWTI^{-}(-1) and ΔWTI^{-}(-2) insignificant values shows that after 2 lags negative oil price shock does not influence the equity return. ΔWTI^{-}(-3) shows that after 3 lags 1% variation in negative oil price shock results in 21.2% decrease in equity returns.

In JKSE, ΔWTI^{+} shows that variation of 1% in positive oil price shock causes 2.21% increase in equity returns. ΔWTI^{+}(-1) shows that variation of 1% in positive oil price shock causes 1.82% increase in equity returns. ΔWTI^{+}(-2) shows that after 2 lags positive oil price shock does not influence the equity return. ΔWTI^{-} shows that variation of 1% in negative oil price shock causes 3.1% rise in equity returns.

Table 4.10: Linear ARDL Model

Variables	AXJO	HIS	BSE	JKSE	TA125	N225	KS11
ΔWTI^{+}	2.7692	16.2404	-402.9725	2.2149	0.5536	_	1.1356
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	_	(0.0003)
ΔWTI^{+}**(-1)**	6.0524	17.4642	135.2489	1.8245	0.0437	_	1.0687
	(0.0000)	(0.0000)	(0.0706)	(0.0008)	(0.7239)	_	(0.0008)
ΔWTI^{+}**(-2)**	_	5.6738	142.1290	0.8776	0.3174	_	0.5966
	_	(0.1553)	(0.0571)	(0.1046)	(0.0078)	_	(0.0452)
ΔWTI^{+}**(-3)**	_	_	265.1208	_	_	_	_
	_	_	(0.0004)	_	_	_	_
ΔWTI^{-}	4.9184	42.1633	329.5086	3.1412	1.2833	12.7629	2.5421
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0005)	(0.0000)
ΔWTI^{-}**(-1)**	5.6118	23.8606	-2.0375	3.2863	0.1679	14.4374	1.6666
	(0.0000)	(0.0000)	(0.9770)	(0.0000)	(0.1552)	(0.0001)	(0.0000)
ΔWTI^{-}**(-2)**	_	_	-132.5656	-0.1628	_	_	_
	_	_	(0.0611)	(0.7499)	_	_	_
ΔWTI^{-}**(-3)**	_	_	-212.6042	1.1885	_	_	_
	_	_	(0.0025)	(0.0128)	_	_	_

ΔWTI^{+}= *Positive shock,* ΔWTI^{-} = *Negative shock,(-1),(-2),(-3) are lag values*

ΔWTI^-(-1) shows that after 1 lag variation of 1% in negative oil price shock causes 3.2% rise in equity returns. ΔWTI^-(-2) insignificant values shows that after 2 lags oil price negative shock does not influence the equity return. ΔWTI^-(-3) shows that after 3 lags 1% variation in oil price negative shock results in 1.18% increase in equity returns.

In TA125, ΔWTI^+ shows that variation of 1% in positive oil price shock causes 55% rise in equity returns. ΔWTI^+(-1) shows that variation of 1% in positive oil price shock causes 43% growth in equity returns. ΔWTI^+(-2) shows that after 2 lags variation of 1% in positive oil price shock causes 31% rise in equity returns. ΔWTI^- shows that variation of 1% in positive oil price shock causes 1.2% rise in equity returns. ΔWTI^-(-1) shows that after 1 lag variation of 1% in negative oil price shock causes 1.6% rise in equity returns.

In N225, ΔWTI^- shows that variation of 1% in negative oil price shock causes 12% rise in equity returns. ΔWTI^-(-1) shows that after 1 lag variation of 1% in negative oil price shock causes 14% rise in equity returns.

In KS11, ΔWTI^+ shows that variation of 1% in positive oil price shock causes 11% rise in equity returns. ΔWTI^+(-1) shows variation of 1% in positive oil price shock causes 10% rise in equity returns. ΔWTI^+(-2) shows that after 2 lags variation of 1% in positive oil price shock causes 5.9% increase in equity returns. ΔWTI^- shows that variation of 1% in negative oil price shock causes 2.5% increase in equity returns. ΔWTI^-(-1) shows that after 1 lag variation of 1% in negative oil price shock causes 1.6% rise in equity returns. ΔWTI^-(-2) insignificant values shows that oil price negative shock not influences the equity return after 2 lags. ΔWTI^-(-3) shows that after 3 lags 1% variation in price of oil results in 1.18% increase in equity returns.

In KLSE, ΔWTI^+ shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^+(-1) shows that variation of 1% in positive oil price shock causes 1.1% increase in equity returns. ΔWTI^- shows that variation of 1% in positive oil price shock causes 1.04% increase in equity returns. ΔWTI^-(-1) shows that after 1 lag 1% change in oil price negative shock results in 3.8% increase in equity returns.

In NZ50, ΔWTI^{+} exhibits that 1% variation in oil price positive shock results in 12% rise in equity returns. ΔWTI^{+}(-1) exhibits that 1% variation in oil price positive shock results in 13% rise in equity returns. ΔWTI^{-} exhibits that 1% variation in oil price negative shock results in 1.8% rise in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in oil price negative shocks results in 2.5% rise in equity returns.

In KSE, ΔWTI^{+} and ΔWTI^{+}(-1) shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{+}(-2) shows that after 2 lags 1% variation in positive oil price shock results in 6.14% increase in equity returns. ΔWTI^{+}(-3) shows that after 3 lags 1% variation in positive oil price shock results in 6.97% decrease in equity returns. ΔWTI^{-} shows that 1% variation in negative oil price shock has no effect on equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in negative oil price shock results in 9.74% increase in equity returns.

In PSESI, ΔWTI^{+} depicts that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{+}(-1)shows that after 1 lag 1% variation in positive oil price shock results in 3.6% increase in equity returns. ΔWTI^{+}(-2) shows that after 2 lags 1% variation in positive oil price shock results in 1.8% increase in equity returns. ΔWTI^{-} shows that 1% variation in negative oil price shock results in 2.8% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% change in negative oil price shocks results in 4.1% increase in equity returns. ΔWTI^{-}(-2) insignificant values shows that after 2 lags oil price negative shock does not influence the equity return.

In TASI, ΔWTI^{+} shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{+}(-1) shows that 1% variation in positive oil price shock results in 6.1% increase in equity returns. ΔWTI^{+}(-2) shows that after 2 lags oil price positive shock does not influence the equity return. ΔWTI^{-} shows that 1% variation in oil price negative shock results in 7.2% rise in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% change in oil price negative shock results in 5.4% rise in equity returns.

Table 4.11: Linear ARDL Model

Variables	**KLSE**	**NZ50**	**KSE**	**PSESI**	**TASI**	**FTSEST**	**CSE**	**TWII**
ΔWTI^{+}	0.0453	1.2295	3.2773	-0.0766	1.3218	–	0.7681	3.1237
	(0.8683)	(0.0260)	(0.2927)	(0.9223)	(0.4564)	–	(0.1155)	(0.1825)
ΔWTI^{+}**(-1)**	1.1157	1.3875	0.2778	3.6894	6.1231	–	–	4.6458
	(0.0001)	(0.0128)	(0.9295)	(0.0000)	(0.0006)	–	–	(0.0495)
ΔWTI^{+}**(-2)**	–	–	6.1480	1.8790	–	–	–	–
	–	–	(0.0366)	(0.0177)	–	–	–	–
ΔWTI^{+}**(-3)**	–	–	-6.9743	–	–	–	–	–
	–	–	(0.0172)	–	–	–	–	–
ΔWTI^{-}	1.0471	1.8657	1.9049	2.8080	7.2251	0.6447	-0.0303	9.2032
	(0.0001)	(0.0004)	(0.5239)	(0.0002)	(0.0000)	(0.0002)	(0.9479)	(0.0000)
ΔWTI^{-}**(-1)**	0.3813	2.5565	9.7455	4.1213	5.4198	0.4437	1.2612	8.0770
	(0.1423)	(0.0000)	(0.0011)	(0.0000)	(0.0014)	(0.0090)	(0.0035)	(0.0003)
ΔWTI^{-}**(-2)**	–	–	–	-1.1773	–	0.2979	0.0301	–
	–	–	–	(0.1150)	–	(0.0795)	(0.9445)	–
ΔWTI^{-}**(-3)**	–	–	–	1.3048	–	-0.4504	0.9903	–
	–	–	–	(0.0604)	–	(0.0081)	(0.0220)	–

In FTSEST, ΔWTI^{-} shows that 1% variation in oil price negative shock results in 64% rise in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in oil price negative shock results in 44% rise in equity returns. ΔWTI^{-}(-2) insignificant values shows that after 2 lags oil price negative shock does not influence the equity return. ΔWTI^{-}(-3) shows that after 3 lags 1% change in oil price results in 45% decrease in equity returns.

In CSE, ΔWTI^{+} shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{-} shows that 1% variation in oil price negative shock does not influence the equity return. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in negative oil price shock results in 1.26% increase in equity returns. ΔWTI^{-}(-2) insignificant value shows that after 2 lags oil price negative shock does not influence the equity return. ΔWTI^{-}(-3) shows that after 3 lags 1% variation in oil price results in 9.9% increase in equity returns.

In TWII, ΔWTI^{+} shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{+}(-1) exhibits that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{-} shows that 1% variation in negative oil price shock results in 9.2% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in negative oil price shock results in 8.07% increase in equity returns.

The above results indicate that positive shock in oil price exists up to 1 lag in AXJO, HSI, JKSE, KLSE, NZ50, TASI and TWII. Positive shock in oil price exists up to 2 lags in TA125, KS11 and PSESI. Positive shock in oil price exists up to 3 lags in BSE and KSE. Positive oil price shock does not exist in N225, FTSEST and CSE. Negative oil price shock exists up to 1 lag in AXJO, HSI, N225, KS11, NZ50, KSE, PSESI, TASI and TWII. Negative oil price shock exists up to 3 lags in BSE, JKSE, FTSEST and CSE. Negative oil price shock does not exist in TA125 and KLSE.

4.5.2 Non-Linear ARDL Model

The table 4.12 reports the results of non-linear ARDL connection of oil market with equity return. The table 4.12 exhibits the non-linear connection of oil prices with equity return in long run and short run. In AXJO, WTI^+ and WTI^- shows that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^+ shows that 1% variation in positive oil price shock results in 2.76% increase in equity returns. ΔWTI^+(-1) shows that 1% variation in positive oil price shock results in 6.05% increase in equity returns. ΔWTI^- shows that 1% variation in negative oil price shock results in 4.9% increase in equity returns. ΔWTI^-(-1) shows that after 1 lag 1% variation in negative oil price shock results in 5.61% increase in equity returns.

In HSI, WTI^+ and WTI^- exhibits that oil price positive and negative shock does not influence the equity return in long run. Whereas in short run, ΔWTI^+ shows that variation of 1% in positive shock in oil price causes 16.24% increase in equity returns. ΔWTI^+(-1) shows that variation of 1% in positive shock in oil price causes 11.79% increase in equity returns. ΔWTI^+(-2) shows that after 2 lags there is no effect of change in positive oil price shocks on equity returns.

ΔWTI^- shows that that variation of 1% in negative shock in oil price causes 42% rise in equity returns. ΔWTI^-(-1) shows that after 1 lag 1% variation in oil price negative shock results in 23% rise in equity returns. In BSE, WTI^+ and WTI^- shows that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^+ exhibits that 1% variation in positive oil price shock results in 40.2% decrease in equity returns. ΔWTI^+(-1) shows that 1% variation in positive oil price shock not influences the equity return. ΔWTI^+(-2) shows that after 2 lags that oil price positive shock does not influence the equity return. ΔWTI^+(-3) shows that after 3 lags 1% variation in positive oil price shock results in 265.12% increase in equity returns. ΔWTI^- shows that 1% variation in negative oil price shock results in 329.50% increase in equity returns. ΔWTI^-(-1) and ΔWTI^-(-2) insignificant values shows that after 2 lags that oil price negative shock not influences the equity return. ΔWTI^-(-3) shows that after 3 lags 1% variation in oil price results in 212.60% decrease in equity returns.

Table 4.12: Non-Linear ARDL Model

Variables	**AXJO**	**HIS**	**BSE**	**JKSE**	**TA125**	**N225**	**KS11**
WTI^{+}	-12.7861	58.8291	-0.0228	3.2337	2.4321	-52.7329	5.5003
	(0.6680)	(0.1824)	(0.9970)	(0.4228)	(0.3951)	(0.2846)	(0.2507)
WTI^{-}	-14.7145	51.6614	-10.9538	0.7692	1.9283	-56.9984	4.6560
	(0.6288)	(0.2512)	(0.0725)	(0.8517)	(0.5098)	(0.2570)	(0.3413)
ΔWTI^{+}	2.7692	16.2404	-402.9725	2.2149	0.5536	-0.1366	1.1356
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.3122)	(0.0003)
ΔWTI^{+}**(-1)**	6.0524	11.7904	-6.8801	0.9469	-0.2737	_	0.4721
	(0.0000)	(0.0479)	(0.9501)	(0.2317)	(0.1139)	_	(0.2898)
ΔWTI^{+}**(-2)**	_	5.6738	-122.9918	0.8776	0.3174	_	0.5966
	_	(0.1553)	(0.2634)	(0.1046)	(0.0078)	_	(0.0452)
ΔWTI^{+}**(-3)**	_	_	265.1208	_	_	_	_
	_	_	(0.0004)	_	_	_	_
ΔWTI^{-}	4.9184	42.1633	329.5086	3.1412	1.2833	12.7629	2.5421
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0005)	(0.0000)
ΔWTI^{-}**(-1)**	5.6118	23.8606	130.5280	3.4490	0.1679	14.4374	1.6666
	(0.0000)	(0.0000)	(0.2172)	(0.0000)	(0.1552)	(0.0001)	(0.0000)
ΔWTI^{-}**(-2)**	_	_	80.0386	-1.3513	_	_	_
	_	_	(0.4489)	(0.0601)	_	_	_
ΔWTI^{-}**(-3)**	_	_	-212.6042	1.1885	_	_	_
	_	_	(0.0025)	(0.0128)	_	_	_

WTI^{+} and WTI^{-} = Positive and Negative shock in Long run, ΔWTI^{+} and ΔWTI^{-} = Positive shocks and Negative shocks in short run

In JKSE, WTI^+ and WTI^- exhibits that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^+ shows that 1% variation in positive oil price shock results in 2.21% increase in equity returns. ΔWTI^+(-1) shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^+(-2) depicts that after 2 lags oil price positive shock does not influence the equity return. ΔWTI^- shows that 1% variation in oil price negative shock results in 3.14% rise in equity returns. ΔWTI^-(-1) shows that 1% variation in oil price negative shock results in 3.44% rise in equity returns. ΔWTI^-(-2) insignificant values that after 2 lags oil price negative shock does not influence the equity return. ΔWTI^-(-3) shows that after 3 lags 1% variation in oil price results in 1.18% increase in equity returns.

In TA125, WTI^+ and WTI^- exhibits that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^+ shows that 1% variation in oil price positive shock causes 55% rise in equity return. ΔWTI^+(-1) shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^+(-2) shows that after 2 lags the variation in positive oil price shocks results in 31% increase in equity returns. ΔWTI^- shows that 1% variation in negative oil price shock results in 1.28% increase in equity returns. ΔWTI^-(-1) shows that 1% variation in negative oil price shock not influences the equity return.

In N225, WTI^+ and WTI^- shows that after 1 lag oil price positive and negative shock does not influence the equity return in long run. Whereas in short run, ΔWTI^+ exhibits that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^- exhibits that 1% variation in oil price negative shock results in 12% rise in equity returns. ΔWTI^-(-1) shows that 1% variation in oil price negative shock results in 14% rise in equity returns after 1 lag.

In KS11, WTI^+ and WTI^- shows that oil price positive and negative shock does not influence the equity return in long run. Whereas in short run, ΔWTI^+ shows that 1% variation in positive oil price shocks results in 1.13% increase in equity returns. ΔWTI^+(-1) shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^+(-2) depicts that after 2 lags oil price positive shock does not influence the equity return. ΔWTI^{-} shows that 1% variation in oil price negative shock results in 2.54% rise in equity returns. ΔWTI^{-}(-1) shows that 1% variation in oil price negative shock results in 1.66% rise in equity returns after 1 lag.

In KLSE, WTI^{+} and WTI^{-} shows that oil price positive and negative shock does not influence the equity return in long run. Whereas in short run, ΔWTI^{+} exhibits that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{+}(-1) exhibits that 1% variation in positive oil price shock results in 1.1% increase in equity returns. ΔWTI^{-} exhibits that 1% variation in negative oil price shock results in 1.04% increase in equity returns. ΔWTI^{-}(-1) exhibits that 1% variation in oil price negative shock does not influence the equity return.In NZ50, WTI^{+} and WTI^{-} exhibits that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^{+} shows that 1% variation in positive oil price shocks results in 1.22% increase in equity returns. ΔWTI^{+}(-1) shows that 1% variation in positive oil price shocks results in 1.38% increase in equity returns.

ΔWTI^{-} shows that 1% variation in oil price negative shock results in 1.86% rise in equity returns. ΔWTI^{-}(-1) shows that 1% variation in oil price negative shock results in 2.55% rise in equity returns. In KSE, WTI^{+} and WTI^{-} exhibits that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^{+} and ΔWTI^{+}(-1) shows that 1% variation in oil price positive shock does not influence the equity return. ΔWTI^{+}(-2) exhibits that after 2 lags variation in positive oil price shock causes 13% increase in equity returns. ΔWTI^{+}(-3) shows that after 3 lags 1% variation in positive oil price shock results in 6.9% decrease in equity returns. ΔWTI^{-} insignificant value shows that oil price negative shock does not influence the equity return. ΔWTI^{-}(-1) shows that 1% variation in negative oil price shock results in 9.74% increase in equity returns. In PSESI, WTI^{+} and WTI^{-} shows that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^{+} and ΔWTI^{+}(-1) exhibits that 1% variation in oil price positive shock does not influence the equity return.

Table 4.13: Non-Linear ARDL Model

Variables	**KLSE**	**NZ50**	**KSE**	**PSESI**	**TASI**	**FTSEST**	**CSE**	**TWII**
WTI^{+}	0.9957	-51.1342	-84.4955	-8.6895	72.7454	5.5779	33.3465	-6.4125
	(0.8458)	(0.3349)	(0.3262)	(0.5640)	(0.0005)	(0.0016)	(0.0580)	(0.8904)
WTI^{-}	0.4790	-57.7056	-106.0660	-11.7336	70.5195	5.2799	30.8864	-10.3852
	(0.9270)	(0.3003)	(0.2258)	(0.4446)	(0.0009)	(0.0033)	(0.0845)	(0.8271)
ΔWTI^{+}	0.0453	1.2295	3.2773	-0.0766	1.3218	0.0215	0.7681	3.1237
	(0.8683)	(0.0260)	(0.2927)	(0.9223)	(0.4564)	(0.0009)	(0.1155)	(0.1825)
ΔWTI^{+}**(-1)**	1.1157	1.3875	-5.8702	1.8104	6.1231	_	_	4.6458
	(0.0001)	(0.0128)	(0.1820)	(0.1191)	(0.0006)	_	_	(0.0495)
ΔWTI^{+}**(-2)**	_	_	13.1223	1.8790	_	_	_	_
	_	_	(0.0016)	(0.0177)	_	_	_	_
ΔWTI^{+}**(-3)**	_	_	-6.9743	_	_	_	_	_
	_	_	(0.0172)	_	_	_	_	_
ΔWTI^{-}	1.0471	1.8657	1.9049	2.8080	7.2251	0.6447	-0.0303	9.2032
	(0.0001)	(0.0004)	(0.5239)	(0.0002)	(0.0000)	(0.0002)	(0.9479)	(0.0000)
ΔWTI^{-}**(-1)**	0.3813	2.5565	9.7455	5.2986	5.4198	0.1460	1.2311	8.0770
	(0.1423)	(0.0000)	(0.0011)	(0.0000)	(0.0014)	(0.5551)	(0.0491)	(0.0003)
ΔWTI^{-}**(-2)**	_	_	_	-2.4821	_	0.7483	-0.9602	_
	_	_	_	(0.0183)	_	(0.0025)	(0.1249)	_
ΔWTI^{-}**(-3)**	_	_	_	1.3048	_	-0.4476	0.9903	_
	_	_	_	(0.0604)	_	(0.0085)	(0.0220)	_

ΔWTI^{+}(-2) shows that after 2 lags variation in positive oil price shock results in 1.87% increase in equity returns. ΔWTI^{-} exhibits that 1% variation in negative oil price shock results in 2.80% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in oil price results in 5.29% increase in equity returns. ΔWTI^{-}(-2) shows that after 2 lags 1% variation in oil price results in 2.48% decrease in equity returns. ΔWTI^{-}(-3) insignificant values shows that after 3lags oil price negative shock does not influence the equity return.

In TASI, WTI^{+} oil price positive shock results in 72% rise in equity return and WTI^{-} shows that negative oil price shock results in 70% rise in equity return in long run. Whereas in short run, ΔWTI^{+} shows that 1% variation in positive oil price shocks has no influence on equity returns. ΔWTI^{+}(-1) shows that after 1 lags variation in positive oil price shocks results in 6.12% increase in equity returns. ΔWTI^{-} shows that 1% variation in negative oil price shocks results in 7.2% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lags 1% change in oil prices results in 5.4% increase in equity returns.

In FTSEST, WTI^{+} shows that positive oil price shock results in 5.5% increase in equity return and WTI^{-} shows that negative oil price shock causes 5.2% increase in equity return in long run. Whereas in short run, ΔWTI^{+} shows that 1% variation in positive shock in oil price causes 2.1% rise in equity returns. ΔWTI^{-} shows that 1% variation in negative oil price shocks results in 63% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lags 1% variation in negative shock of oil price not influences equity return. ΔWTI^{-}(-2) shows that after 2 lags variation of 1% in negative oil price shock causes 74% rise in equity returns. ΔWTI^{-}(-3) shows that after 3 lags 1% change in negative oil price shock results in 44% decrease in equity returns.

In CSE, WTI^{+} and WTI^{-} shows that oil price positive and negative shock does not influence the equity return in long run. Whereas in short run, ΔWTI^{+} shows that 1% variation in positive oil price shock has no effect on equity returns. ΔWTI^{-}, ΔWTI^{-}(-1), ΔWTI^{-}(-2) shows that after 2 lags variation in oil price negative shock does not influence the equity return. ΔWTI^{-}(-3) shows that after

3 lags 1% variation in negative oil price shock results in 9.9% increase in equity returns.

In TWII, WTI^{+} and WTI^{-} exhibits that oil price positive and negative shock not influences the equity return in long run. Whereas in short run, ΔWTI^{+} and ΔWTI^{+}(-1) shows that 1% variation in positive oil price shock does not influence the equity return. ΔWTI^{-} exhibits that 1% variation in negative oil price shock results in 92% increase in equity returns. ΔWTI^{-}(-1) shows that after 1 lag 1% variation in negative oil price shock results in 80% increase in equity returns.

In NARDL model, the above results indicate that in short run, positive oil price shock exists up to 1 lag in AXJO, KLSE, NZ50 and TASI. Positive shock in oil price exists up to 2 lags in TA125 and PSESI. Positive shock in oil price exists up to 3 lags in BSE. Positive oil price shock does not exist in HSI, JKSE, N225, KS11, KSE, FTSEST, CSE and TWII. Negative shock in oil price exists up to 1 lag in AXJO, HSI, N225, KS11, NZ50, KSE and TASI. Negative shock in oil price exists up to 2 lags in PSESI. Negative shock in oil price exists up to 3 lags in BSE, JKSE, FTSEST and CSE. Negative shock in oil price does not exist in TA125, KLSE and TWII.

4.6 Oil Price Impact on Oil Exporter and Oil Importer Countries

The table 4.14 exhibits the difference of relationship of oil price with equity return of oil exporter and oil importer countries.

Table 4.14: Oil Price & Oil Exporter and Importer Countries

Series	**Constant**	**Std.Error**	**Probability**
Constant	0.000320	0.000464	0.4905
$\mathbf{R}_o$	0.026418	0.030697	0.3895
$\mathbf{R}_o$***D**	-0.015788	0.040233	0.6947

*R_o represents the oil exporter countries and R_o*D represents the oil importer countries.*

In the table-4.14 insignificant values of R_o and R_o*D shows that there is no impact of oil prices on equity returns of oil exporter and importer countries. Filis et al. (2011) finds no impact of oil prices on equity returns of oil importing and exporting countries.

4.7 Discussion

This study examined the connection of oil price with equity markets of Australia (AXJO), China (HIS), India (BSE), Indonesia (JKSE), Israel (TA125), Japan (N225), Korea (KS11), Malaysia (KLSE), New Zealand (NZ50), Pakistan (KSE100), Philippine (PSESI), Saudi Arabia (TASI), Singapore (FTSEST), Sri Lanka (CSE) and Taiwan (TWII) stocks. Empirical results provide the evidence that there is no co-integration among oil price and equity market of Asian countries and VAR model is applied to investigate the long run connection of oil prices with equity market by employing the monthly data (Lee and Chiou, 2011).

In ARMA-GARCH, daily data of equity returns is employed. The stock market is inefficient and there is a connection among past and present equity returns of Australia, Indonesia, Malaysia, Pakistan and Singapore. There is no connection among past and present equity returns of China, India, Israel, Japan, Korea, New Zealand, Philippine, Saudi Arabia, Srilanka and Taiwan. Forecasted conditional volatility can be used for forecasting the returns of equity markets of Australia, Indonesia, Israel, Korea, Pakistan and Taiwan. Where volatility cannot forecast returns of China, India, Singapore, Malaysia, New Zealand, Philippine, Saudi Arabia and Srilanka. 3 significant value depicts that on past price shocks equity market make corrections on next day and equity market moves oppositely to adjusts the negative returns on next day in Australia, India, Israel and Singapore. Past price shocks do not adjust the returns on next day in China, New Zealand, Indonesia, Korea, Srilanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan. ARCH effect shows that past price behavior can be used to predict the future volatility of Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Srilanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan equity market. GARCH effect depicts persistence of volatility in Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Srilanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan equity market. From oil market mean spillover transfers to equity market of Australia, China, Israel, Korea, Malaysia, New Zealand, Pakistan, Singapore and Taiwan. The results indicate the absence of transmission of mean spillover from oil market to equity market of India, Indonesia, japan, Srilanka, Philippine and Saudi Arabia. The study finds the volatility spillover from oil price to equity return of Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Srilanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan equity market. (Arouri et al., 2012) also finds critical volatility spillover from oil market to equity returns in European markets.

In DCC-GARCH, E-GARCH model is applied on AXJO, JKSE, KS11, KLSE, NZ50, KSE, PSESI, FTSEST and TWII whereas GJR-TARCH model is applied on HSI, and TASI in accordance with the minimum AIC identified. However, the results indicate that there is no dynamic conditional correlation exists in India, Israel, Japan and Sri Lanka stock markets. θ_1 insignificant value shows that past price shock does not exists and through past correlation current correlation cannot be predicted in AXJO, JKSE, KS11, KLSE, NZ50, KSE, PSESI and TASI. θ_1 significant value shows that past price shock exists and through past correlation current correlation can be predicted in FTSEST, TWII and HSI. θ_2 significant value shows that relationship between lag and current correlation exists in equity market of AXJO, HSI, KS11, KLSE, TASI, FTSEST and TWII. θ_2 insignificant value shows that relationship between lag and current correlation does not exist in equity market of JKSE, NZ50, KSE, CSE and PSESEI.

In Long run linear ARDL model, positive oil price shock exists up to 2 lags in AXJO, HSI, KLSE, NZ50, TWII and negative oil price shocks exists up to 2 lags in AXJO, HSI, JKSE, N225, KS11, TASI, NZ50, KSE, TASI and TWII. Positive oil price shock does not exist in HSI, KS11, JKSE, N225 and CSE. Positive oil price shock exists up to 1 lag in BSE, FTSEST and negative oil price shocks exists up to 1 lag in BSE and TA125. Positive oil price shock exists up to 3 lags in

TA125 and PSESI. Negative oil price shock exists up to 4 lags in PSESI, FTSEST and CSE. In short run linear ARDL model, positive oil price shock exists up to 1 lag in AXJO, HSI, JKSE, KLSE, NZ50, TASI and TWII. Positive oil price shock exists up to 2 lags in TA125, KS11 and PSESI. Positive oil price shock exists up to 3 lags in BSE and KSE. Positive oil price shock does not exist in N225, FTSEST and CSE. Negative oil price shock exists up to 1 lag in AXJO, HSI, N225, KS11, NZ50, KSE, PSESI, TASI and TWII. Negative oil price shock exists up to 3 lags in BSE, JKSE, FTSEST and CSE. Negative oil price shock does not exist in TA125 and KLSE.

In NARDL model, the study find that there is no asymmetric impact of oil price shock on equity return of Asian market in long run however Jones and Kaul (1996) provides evidence of presence of asymmetric relation of oil price with equity return in short run. The vast majority of prior studies on the oil price connection with equity return find that basic factors examined the direct link of oil price with equity return (Zhu et al., 2011). Salisu and Isah (2017) finds the asymmetric relationship of oil prices with equity return. In short run, positive oil price shock exists up to 1 lag in AXJO, KLSE, NZ50 and TASI. Positive oil price shock exists up to 2 lags in TA125 and PSESI. Positive oil price shock exists up to 3 lags in BSE. Positive oil price shock does not exist in HSI, JKSE, N225, KS11, KSE, FTSEST, CSE and TWII. Negative shock in oil price exists up to 1 lag in AXJO, HSI, N225, KS11, NZ50, KSE and TASI. Negative shock in oil price exists up to 2 lags in PSESI. Negative shock in oil price exists up to 3 lags in BSE, JKSE, FTSEST and CSE. Negative shock in oil price does not exist in TA125, KLSE and TWII. While examining the oil price impact on oil importer and exporter countries, the results exhibits that the insignificant values of R_{Oil} representing the oil exporter country and $R_{Oil}\times D$ representing the oil importer country interprets that oil price impact on equity return of oil importer and exporter countries is same.

In this study, the long run and short run relation of oil price with equity return has been studied. However, the results indicate the presence of long term relation of oil prices with equity return and absence of short run relationship. VAR model is applied on the series of AXJO, HIS, BSE, JKSE, TA125, N225, KS11, KLSE, NZ50, KSE, PSESI, TASI, FTSEST, CSE and TWII to measure the long term relationship, so the H1 has been accepted. The absence of short term relationship indicates the rejection of H2. The results indicate the volatility spillover from oil market to equity market in AXJO, HIS, BSE, JKSE, TA125, N225, KS11, KLSE, NZ50, KSE, PSESI, TASI, FTSEST, CSE and TWII so it identifies the acceptance of H3. Hence, the results indicate that there is no mean spillover from oil market to equity market in BSE, JKSE, N225, CSE, PSESI and TASI, so H3 has been rejected. The presence of mean spillover in AXJO, HIS, TA125, KLSE, NZ50, KSE, FTSEST, CSE and TWII denotes the acceptance of H3. As the results identifies that there is no asymmetric oil price effect on equity return of Asian market in long run however provides the evidence of presence of asymmetric relation of oil price with equity return in short run. In this way, the H4 has been accepted in AXJO, HIS, BSE, JKSE, TA125, N225, KS11, KLSE, NZ50, KSE, PSESI, TASI, FTSEST, CSE and TWII. The results indicate the absence of time varying relationship in India, Israel, Japan and Sri Lanka stock markets which results in rejection of H5. However, the H5 is accepted in AXJO, HIS, JKSE, KS11, KLSE, NZ50, KSE, PSESI, TASI, FTSEST and TWII stock markets. The insignificant results of the oil importer and exporter countries identifies the rejection of H6 in AXJO, HIS, BSE, JKSE, TA125, N225, KS11, KLSE, NZ50, KSE, PSESI, TASI, FTSEST, CSE and TWII equity markets. It signifies that there is no difference among connection of oil prices with equity returns whether it is oil importing or oil exporting country.

Chapter 5

Discussion and Conclusion

5.1 Conclusion

This study emphasizes on the long term and short run connection of oil price with equity return as it acquires a crucial implication for policy makers and investors. The investors and policy makers can use the results of this study to accurately forecast the oil price volatility. This study indicates the long run connection of oil price with equity return whereas empirical results finds no evidence of short run connection of oil price with equity return. The empirical results show that there is transmission of mean spillover from oil market to equity market of Australia, China, Israel, Korea, Malaysia, New Zealand, Pakistan, Singapore and Taiwan. However, finds no empirical evidence of transmission of mean spillover from oil market to equity market of India, Indonesia, japan, Sri Lanka, Philippine and Saudi Arabia. The study finds the transmission of oil markets volatility spillover to equity market of Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Sri Lanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan. This study finds no dynamic conditional correlation in India, Israel, Japan and Sri Lanka equity markets. Current correlation cannot be predicted through past correlation in AXJO, JKSE, KS11, KLSE, NZ50, KSE, PSESI and TASI. Current correlation can be predicted through past correlation in

FTSEST, TWII and HSI. The connection among lag and current correlation exists in AXJO, HSI, KS11, KLSE, TASI, FTSEST and TWII. Whereas, this study finds absence of relationship among current and lag correlation in JKSE, NZ50, KSE, CSE and PSESEI. This study also explores the oil price asymmetric impact on equity returns of AXJO, HSI, BSE, JKSE, TA125, N225, KS11, KLSE, NZ50, KSE, PSESI, TASI, FTSEST, CSE and TWII stocks. In long run linear ARDL model, the results indicate the asymmetric impact of oil price on equity return of AXJO, BSE, TA125, KLSE, NZ50, KSE, PSESI, TASI, FTSEST and TWII. However, this study finds the symmetric impact of oil price on equity returns of HSI, KS11, JKSE, N225 and CSE. In short run linear ARDL model, the results indicate the asymmetric impact of oil price on equity return of AXJO, HSI, BSE, JKSE, KS11, NZ50, KSE, PSESI, TASI and TWII. The empirical results show the symmetric oil price connection with equity return of N225, FTSEST, TA125, KLSE and CSE. In NARDL model, the results show the oil price asymmetric impact on equity return of AXJO, BSE, NZ50, PSESI and TASI. Whereas finds the symmetric impact of oil price shocks on equity return of HSI, JKSE, N225, KS11, KSE, FTSEST, CSE, TA125, KLSE and TWII. Moreover, this study investigates the difference of linkage among oil price and equity return in context of oil importer and exporter countries however, the empirical evidences show that there is no impact of oil price on equity return whether it is oil importer or importer country. This study helps the policy makers and investors in accurate prediction of oil market to adjust their holdings in equity market. Over the last two decades, asymmetric oil price impact grabs the attention of so many researchers hence it becomes the predominant topic for research. In this context it also seizes the attention of policy makers and investors to keenly observe the oil price movement to hide themselves from unexpected loss in future due to oil price shocks.

5.2 Recommendations and Policy Implications

- This study identifies the dependency among oil and equity market so the investors should focus on portfolio diversification to avoid unexpected loss in future. Well diversified portfolio helps the investors to hedge themselves from oil price shocks.

- As the long term connection of oil market with equity return may exists in Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Sri Lanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan equity markets so the investors should focus on portfolio diversification.

- Effective investment strategy should be introduced by the investors and policy makers to avoid the worst effects of oil price shocks.

- The mean spillover transmits from oil market to equity markets of India, Indonesia, Japan, Sri Lanka, Philippine and Saudi Arabia which influences the equity return. Investors should be aware of it that variations in oil market may also influence their portfolios return. .

- As the volatility spillover may transmit from oil market to Australia, India, Israel, Singapore, China, New Zealand, Indonesia, Korea, Sri Lanka, Malaysia, Japan, Philippine, Saudi Arabia, Pakistan and Taiwan equity market which exhibits that global equity markets are not independent of the variation in oil price so investors should monitor dynamics of oil price to address the oil price influence.

- Effect of positive and negative shock in oil price is not same. Negative shock in oil price has more influence on equity return as compared to positive shock in oil price. So the investors should be vigilant about the variation in oil price

- Variation in oil price has same influence on equity return of oil importer and exporter countries so the oil should be observed as main input variable of an economy.

- Policy makers and investors should keenly observe the fluctuations in oil price to forecast the transformation of oil market volatility to equity market so that it may not adversely affect the equity return.

5.3 Future Research Direction

This study is conducted on macro level by taking into consideration the aggregate equity returns of Asian market. In future the research can be conducted on micro level. The fluctuations in oil price impact on firm level needs to be discussed. The Long term oil price shocks impact on industrial level also needs to be explored. How the oil prices and oil price shocks affects the interest rates which influences the returns of firms in long term, needs to be explored in future research. Moreover, oil price shocks can be categorized in to crisis, post crisis and after crisis period to investigate the crucial effect of oil price shock on equity return.

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