CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

Co-Movement & Time Varying Correlations Between Oil Prices, Gold Prices And Islamic Equity Indices

by

Qurat ul Ain

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

in the

Faculty of Management & Social Sciences
Department of Management Sciences

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Dedicated to my lovely parents and siblings who love, support, encourage and prayed for me. My teachers, friends and relatives who always helped me to achieve my academic goals.

CERTIFICATE OF APPROVAL

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Abstract

This study was aim to investigate the co-movement and Dynamic conditional correlation between oil Prices, Gold Prices and Islamic Shariah Indices (Islamic Market India Index, Islamic Market Canada Index, Islamic Market U.K. Index, Islamic Market of Japan Index, S&P Kuwait Shariah index, Islamic Market Sri Lanka Index, Islamic Market Turkey Index, Islamic Market China Index). In this study daily data and Islamic equity indices for the time frame of 10/2009 to 11/2019 has been used. DCC & ADCC has been used to examine the time varying nature of conditional correlation. Moreover, co-movement between the series has been checked through JJ approach. The findings of the study show that there is no co-integration between oil Prices, Gold Prices and Islamic Shariah Indices (Islamic Market India Index, Islamic Market Canada Index, Islamic Market U.K. Index, Islamic Market of Japan Index, S&P Kuwait Shariah index, Islamic Market Sri Lanka Index, Islamic Market Turkey Index, Islamic Market China Index). Which means these series does not move s in same direction so benefits of diversification exist. The results of DCC show the time varying nature of conditional correlation and ADDC also indicates there does exist asymmetric behavior.

Keywords: DCC, ADCC, Co-Integration, Co-Movement and Islamic Equities.

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Abbreviations

ADCC	Asymmetric Dynamic Conditional Correlations
DCC	Dynamic Conditional Correlations
DJISRL	Dow Jones Islamic Market Sri Lanka Index
DJICHKU	Dow Jones Islamic Market China/Hong Kong
DJIMTR	Dow Jones Islamic Market Turkey Index
DJIIN	Dow Jones Islamic Market India Index
DJICA	Dow Jones Islamic Market Canada Index
DJIUK	Dow Jones Islamic Market U.K. Index
IFSI	Islamic Financial Service Industry
SPSHJ	S&P Japan 500 Shariah Index
SPSHDK	S&P Kuwait Shariah index
SPGSCLP	S&P GSCI Crude Oil
SPGSGC	S&P GSCI Gold

Chapter 1

Introduction

Islamic Fianancing System is differenct in many ways from the contemporary practices of Conventional Financial System. These practices can be summed up in four major points. First, all investments and deposits are guaranteed implicitly or explicitly, in few situations the capital guarantee amount is written formally by law and regulation. When there is no formal guarantee involved, authorities act on mutual understanding. Second, due to noncompliance of various aspects of profit and loss sharing principal, it is never rigorously applied. Third, Islamic Finance does not take place on the principle of profit and loss sharing thus keep its operations less risky. Fourth, Islamic Finance have choice in deciding whether a collateral is required before getting facilities, as well as profit and loss sharing means of financing (Zahir & Hassn, 2001). Islamic Finance can be explained as a system which is established on principals of Islamic law while guided by Islamic economics. Islamic Finance is based on two fundamental principles first one is sharing of profit and loss and the second one is about forbidding interest collection and payment. Interest is strongly prohibited in Islamic sharia (Sipra, 2002).

Generally whole economy and specifically financial system have vision of reasonable and equitable risk sharing. Equity market is the prime candidate in the list of sectors which are operating on the principal of risk sharing. However, the statement that stock markets are governed under same principle is certain. In addition to this, in majority of the world equity markets are thriving. They are well regulated and organized. According to a large number of Islamic jurists Islamic

Shariah allows investment in current joint stock organizations. Development of a sharia compliant equity market can lead to satisfy those who criticize that Islamic finance has only reformed contractual agreement based on debt which in not much different from interest based contractual agreement, the most vital instrument Islamic finance intended to substitute.

It is not astonishing to see Islamic equities emerging in the international equity market arena. Eventually a large amount of time and energy is devoted in empirical research of various aspect of investments based on Islamic equity. Sharia compliant Islamic equities are attracting much more investments which is motivating researchers to formulate such Islamic instruments which are according to Islamic sharia and acceptable for Muslim investors. Mostly firms including in non-permissive business (in the light of Islamic Teachings) such as Alcohol, gambling, interest-based finance and conventional insurance do not come under the umbrella of Islamic-stock portfolio. According to few sharia jurisdiction businesses such as weapon manufacturing, entertainment and hotels are also excluded from Islamic stock portfolio. Financial ratio application makes significant contribution in limiting the magnitude of interest-based income, cash, receivable and interest-based debt. Funds and investor portfolio following the rules and regulations of sharia are a type of constrained portfolio.

Global economy has been affected by rise in the Oil and Gold price which has managed to get the attention of researchers leading to increase in the research related to these two vital commodities. Oil is included in the list of commodities which are traded most internationally; the fluctuation in the price is not only outcome of major global and political changes but also acted as a precursor for recession and inflation. Investment in Islamic stock can be helpful for a countrys economic indicator as well lowers the chances of inflation (Mohd Hussin & Borhan, 2009).

Previously Islamic finance was limited to Islamic economies but currently it has turned into an international phenomenon. The basic principle of Islamic law (PLS, prohibition of interest, uncertainty and gambling) has not only contributed in industry growth but also has boosted relevant academic research. The Global

Islamic Financial Service Industry was established in 1970 till then it has achieved total value of USD 2.20 Trillion up till 2018. Last ten years have been most outstanding. Following the subprime financial crisis, the interest of researcher has been elevated in Islamic finance due to it resilience in comparison to conventional financial system.

The combined attention from western world and faith-oriented investors has boosted Shariah compliant industry in last two decade specially after 2008 crisis. Moreover, the keen efforts by regulators and oil accumulated wealth in Islamic countries has given more space to industry. In 2016 the size of Islamic financial asset was between US $1.7 and US 2.1$ trillion and it is expected to increase further. The universe of broader Islamic security comprises of Islamic listed stock securities which meet the screening criteria to be included in Shariah compliant securities. Shariah compliant securities also get affected by the price movements and vitality in international stock market (IFSI Stability Report, 2016).

1.1 Theoretical Background

In this modern regime of finance most of the finance researchers and economist gave a lot of their importance to the efficiency of stock market. Basic assumption of modern finance market is that the market is efficient. Whereas the word efficiency create a linkage between information and stock market. The Efficient Market Hypothesis (Abbreviated as EMH) says that the stock prices is reflection of information available in market, which means the price of stock is coated by the available information in the market. Reilly and Brown, (2011) investigated that there is very quick and timely incorporation exist between information and prices of stock, so investor can get reward from its investment according to what amount of information he has. Malkiel and Fama (1970) says that an investor can do better allocation of its resources if he knows that stock price is at on its fair price, this thing can be done in just one way when the investor knows that market is efficient and its presents all information in market. The Efficient Market Hypothesis (EMH) is very firmly supporting this study, as we know that this theory says that

the price of stock is the reflection of all available information in the market, it says that when any information comes into the market, market price that information. When the investors and practitioner will get to know that any new information is about to come into the market they, and they thinks that prices of stock will increase or decrease the adjust there costs according to it so they did not get effect on the arrival of that information. There are some types of information weak from of information, strong form and semi strong form of information. So their decision depends upon that what type of information they get.

There is another theory which is supporting this study which is proposed by Markowitz. He proposed a theory on Portfolio Diversification, Markowitz said do not putt your all eggs in one basket. Markowitz presented a modern theory of portfolio in which he said that if investor will invest his all of money in one security investor will face more risk, but if he will divide his investment in different securities he will minimize his risk. In simple words risk of portfolio is lower than the risk associated to different securities. The risk of expected returns of portfolio can be calculated trough the formula written below:

$$\sigma_p^2 = W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + 2W1W2\sigma_{12}$$

In the above equation W_1^2 is the proportion of one security and σ_1^2 is the risk of the expected returns of one security and W_2^2 and σ_2^2 are the proportion and the standard deviation of the second security, and σ_{12} is covariance of expected returns of both securities. The basic assumption behind the correlation is that it should be less than one, which means it should be less than the risk or standard deviation related to anticipated returns of these securities (Markowitz 1959). We are using this theory in our study because in this study we can see the benefit of diversification. As we know that Gold and Oil are very strong commodities and we can invest in these commodities; now a days Islamic finance is at its boom. In investment context these both are different type of investment so the investors can diversify their portfolios.

1.2 Gap Analysis

There are many studies have been done to see the relationship between conventional equity returns, non-conventional stocks (Islamic Stocks), and the changes in Oil prices by using different methodologies e.g. Aloui et al., (2013) examine the copula dependence between Oil Prices and Stock Markets, Creti et al., (2014) has done co-spectral analysis on Oil Prices and Financial Markets, wavelet analysis has been done on these markets (Ftiti et al., 2015). Alsalman (2016) used VAR and GARCH in mean approach to see which market is more risker oil and gas or coal and uranium, Hernandez (2014) portfolio optimization to check uncertainty between oil prices and US stock. Islamic finance and business research have been quickly growing even in more advanced economies. Bacha, Masih & Saiti (2013) has applied DCC GARCH on the indices of Shariah-Compliant Stock of five countries. Paltrinieri and Kutan (2019) identified a clear gap which needs to fill that is to see the impact of oil and other commodities on Shariah compliant equities. Therefore this study is an effort to fill the gap in both literature and practical field regarding time varying correlation between world crude oil prices, Gold Prices and the Islamic Equity markets and to see the co-movement between oil prices, Gold Prices and Islamic Equities.

1.3 Problem Statement

The ups and downs in Gold and Oil Prices have an effect on the Islamic equity market and it further responds to the fluctuation in gold and oil prices. In last two decades oil prices shocks have been observed (Skintzi & Refenes, 2006; Arouri, jouini & Nguyen, 2011; Aloui, 2007; Elmarzougui & Larue. 2013), and from last two decades Islamic markets are growing. This study has emphasized on the changed caused by fluctuation of oil prices in the Islamic equity market, in our this study we emphasize on time varying volatility between oil prices, gold prices and Islamic equities and we also check the co-movement between oil prices, gold prices and Islamic equities.

1.4 Research Questions

Following research questions are addressed in this study:

Research Question 1

Does any long term relationship exist between crude oil and the Islamic equity indices?

Research Question 2

Is there any short term relationship exist between crude oil and the Islamic equity indices?

Research Question 3

Does any long term relationship exist between Gold and the Islamic equity indices?

Research Question 4

Is there any short term relationship exist between Gold and the Islamic equity indices?

Research Question 5

Is time varying correlation exit between crude oil and Islamic equity indices?

Research Question 6

Is time varying correlation exit between gold and Islamic equity indices?

1.5 Research Objectives

Following are the objectives of the study:

Research Objective 1

To explore co-integration between crude oil and the Islamic equity indices.

Research Objective 2

To explore co-integration between Gold and the Islamic equity indices.

Research Objective 3

To investigation time varying correlation between crude oil and Islamic equity indices.

Research Objective 4

To investigation time varying correlation between gold and Islamic equity indices.

1.6 Significance of the Study

A lot of researchers have conducted studies to explore the linkage among unstable oil prices and conventional banks. In last decade several sectors of Islamic finance have shown exceptional growth such as compliant financial instruments (Mutual Fund, Islamic Stock Indices and Sukuk) and Islamic Banks (Nasr, Lux, Ajmi, & Gupta, 2016; Raza & Ashraf, 2019). However Islamic finance has developed and evolved a lot but there is still need for further research because in comparison to conventional finance Islamic finance is not much explored yet. Islamic finance is touching remarkable growth in last two decades, there are very less studies on Islamic Finance as compare to conventional banking system. This study will help to contribute some knowledge into literature as well as in practical field. This study will be significant to those people who are interested in investing in Islamic equity, they will get to know about the potential of Islamic equity and more people will be willing to avoid commercial banking or conventional business and opt the Islamic sharia compliant businesses. This study will also be helpful to researchers and scholars; this will open further avenues of study and research. As we know that Islamic finance is a new topic and came under discussion in last two decades and very limited literature is available. We will study the co movement of oil, gold prices and Islamic equities.

1.7 Plan of the Study

Chapter 1 includes the introduction, Theoretical Background, Gap Analysis, Problem Statement Research Questions, Research Objectives and Significance of the study. Chapter 2 includes the literature reviews of the past studies and also the hypothesis for the study. Chapter 3 covers the research methodology of the study. Chapter 4 includes the data analysis and results. Finally, Chapter 5 includes the conclusion, recommendations and limitation of the study.

Chapter 2

Literature Review

In the international financial market Sukuk Bond and Islamic equities have managed to get attention especially in the recently held GFC. According to a large number of investors this area is safe and has potential for growth. Combination of thorough screening and over involvement of multi-sectoral real estate in Islamic market indices have made Islamic finance market an attractive option for investor. In 2005 Hussein and Omran, noted that DJIMI produced above expected return and exceeded DJ indices over 1996-2003. Moreover, in 2007, DJIM indexs performance to risk was studied by Al-Zoubi and Maghyereh (2007) who concluded that because of the PLS principal of Islamic finance in term of support and risk DJ World Index was outperformed by DJIM indices. Nevertheless, according to Shamsuddin (2014), this explanation doesnt match with the reality that a large number of DJIMI member businesses are necessarily non-financial having low ethical lines and low debt. Moreover, they are more interested in maximization of shareholders wealth instead of PLS principal.

Another research carried out by Chong and Liu (2009) who supported the position of Shamsuddin (2014) in Islamic financial market of Malaysia. According to them there isnt much difference in the gains from Islamic and conventional deposits. Moreover, they also concluded that a small fraction of Islamic banking is regulated by PLS principal. Results of the Research conducted by Ashraf and Mohammad (2014) and Narayan and Bannigidadmath (2015) showed that in comparison to conventional stocks Islamic stock have high returns and profit, especially

during the previous GFC (Ho et al., 2014). Nandha and Faff (2008) investigated the linkage between fluctuation in oil prices and equity price. In addition to this they also studied how the returns on equity are dis-proportionality affected by oil prices. According to their findings when oil used as input real output was negatively affected and profits for corporate were unfavorably affected. The fluctuation in the equity price turned out to be proportionate not disproportionate as expected when disproportionate price affect was tested on them.

According to Park and Ratti (2008) and ONeil et al., (2008) in a sample of 13 developed stock prices were significantly and statistically negatively affected by oil prices. In addition to this, Lin et al., (2010) found that on the basis of positive expectation effect stock returns in China were positively affected by oil prices. Hussain et al., (2013) noticed a bi-directional granger causality among oil prices and stock returns, in addition to this, in longer run Islamic stock return was only affected by oil prices. However gold rates did not contribute in anticipating fluctuation in Islamic oil prices. Hammoudeh et al., (2014) studies dependence structure among DJIM global index, global risk factor such as US ten-year TB interest rate, implied volatility-VIX and oil prices, and three important equity indices coming from Europe, Asia and USA.

Arfaoui and Rejeb (2017) took monthly data from 1995-2015 and applied simultaneous equation model. And explored a negative relationship between oil and stock prices. We can see from the previously studies that they authenticate that stock prices were affected by common shocks (oil prices), moreover the Islamic counterparts were also affected by conventional stick prices. Successively Islamic stock indices have strong linkage with oil prices. Crude oil and gold are correlated to reach other positively. in the global market both commodities are quoted in USD which causes their relationship to be partly and limited (Nirmala, & Deepthy, 2015). For oil and metal commodities Fattouh (2010) and Ewing et al., (2006) studied the non-uniformity in the process of spread adjustment. Inflation channel was used by many studies to explain the association between oil and gold prices. Many studies (Hooker,2002; Hunt, 2006) empirically confirmed this relation. According to Furlong et al., (1996) with the rise in the oil prices all

other commodities experience increases in price. The rise in inflation rate result in increase in gold prices. Melvin and Sultan (1990) investigated a unique channel. Effect on prices of gold because of revenue from export channel. Majority of the countries have gold as a fundamental element of international reserve portfolio. Whenever prices of oil experience a surge exporters enjoy rise in revenue this may affect the gold prices as well. But this is only possible if oil exporters have gold as a part of their asset portfolio and they do invest in gold as constituent of property. In such situation gold prices increase with increase in oil prices.

The most vital research of this field was conducted during 1970-2010, further this research was segregated and modified to be used for quantitative analysis. Linkage between highlighted variable was presented algebraically, graphically and verbally. The result showed high positive correlation in the collected sample between oil and gold, and some unusual development were also observed. It was also confirmed by applying proportional analysis that the co-movement between oil and gold price is a long-term phenomenon. This was further confirmed by correlation analysis which involved gold mining company stock price, inflation, interest rate and industry. Only the regression model of inflation was verified by least square method. Causal relation between oil prices and gold were determined by granger causality test. Johansen Co-integration test identified long term relation among Vector Error Correction Model Confirmed and examined variable, after fluctuations in market long term equilibrium was attained by both time series return (imkov, 2011).

Jones & Kaul (1996) explored the effect of oil price shocks on international stock market. According to their findings United States and Canadian stock market were impacted by fluctuation in crude oil price and this relation was explained by future and current cash flows. However, in the stock market of Japan and UK impact was more volatilities were and could not be explained though cashflows. Hammoudeh et al., (2010) explored the aspects of important oil market producer such as Brent and WTI by using macroeconomic variable of US and used Kalman filter to estimate shift models. The outcome of this research a substantial casualty among macroeconomics and oil. There is no connection between stock return and oil prices until it is about oil companies (Huang, Masulis & Stoll, 1996). Sadorsky

(1999) came the conclusion that fluctuation in oil prices do affect the economic activities but the vice versa is not correct. Moreover, outcomes also indicate that oil price shock real stock returns have negative connection between them.

To study the relation among technology companies, clean energy companies and oil prices Sadorsky (2012) applied multivariate GARCH model. He found out that not only stock prices of technology companies but also companies related to clean energy production are more closely related than oil prices. Chang et al. in 2013 by using multivariable GARCH model studies volatility spillover and conditional correlation; he found out that there was no relation among financial market and crude oil. In 2013 Mensi et al. studied volatility spillover among commodity indices and S&P 500 and found out they are both interrelated to each other. Gold and oil markets were strongly affected by S&P 500. Nazlioglu, Erdem, & Soytas (2013) studied the transfer of volatility among agriculture commodity prices and oil. According to results for the pre-crisis period there wasnt any volatility spillover. But after the crisis they came to know about the presence of spillover (volatility) initiated from crude oil to agricultural commodities, excluding sugar. Proof of volatility spillover leading from prices of oil to the direction of Ghana stock market were explored by (Lin, Wesseh & Appiah, 2014).

Numerous aspects like diversification, hedging and volatility spillover have been covered by studies conducted on gold prices. Gold price volatility is determined by two vital elements which are political stability and oil prices (Melvin & Sultan, 1990). Weekly gold prices were examined by Capie, Mills & Wood (2005) and came to conclusion that it is possible to use gold as hedge in opposition to change in the value of USD. Roboredo (2013) proposed that it near to impossible for gold to be used as hedge in opposition to fluctuation of oil price. According to Baur and McDermott (2010) gold managed to act as a safe heaven for the US and European Market. Emerging market were able to use gold as a save heaven. Raza, Shahzad, Tiwari & Shahbaz (2016) examined the impact of oil volatilities and gold impact on the stock market of developing economies and they concluded that equity market volatility was negatively impacted by gold and oil.

A study conducted by Pandey (2018) studied the volatility transfer from gold and crude oil to stock market of BRICS, and used EGARCH model to manage volatility asymmetry. This research also investigated that to what extent volatility spillover was altered by 2008 financial crisis. From both gold and crude oil volatility spillover was significantly positive. Volatility of gold and crude oil prices affected BRICS stock market. During the post 2008 crisis situation the mechanism related to oil and gold prices totally altered. Results from analysis conducted on sub samples showed that during the time before crisis only crude oil volatility spillover was significant not from gold. This is because fluctuation in gold prices were not related to fluctuation in the crude oil price. It is quite obvious that only those factors are affecting stock market which are common in gold prices and crude oil prices. During the crisis period BenMabrouk (2018) studies herding behavior encompassing both markets which are crude oil market and stock market. Further investigation was carried on about cross herding behavior among crude oil market and stock market. According to the results there was no herding behavior during non-crisis time around stock market and crude oil market. Nevertheless, in crisis period when market volatility was high the herding behavior in stock market was less significant. However, during financial distress herding behavior increases because of volatility of market.

Empirical evidence related to behavioral contagion between stock market of US, stock market of Oil Importing and Exporting countries in the oil crisis period moreover, US financial one also (2008/2009) after managing fundamentally driven co-movements. The increment in Correlation Coefficient related to fundamental variable in the oil crisis times and US financial one provides an undeniable proof of mimetic contagion among the stock markets and oil market in the high volatility period (2008 Crisis). The vigorous linkage between crude oil, gold, Indian rupee-US dollar and stock market-Sensex GODS (gold, oil, dollars & stock market) in all scenarios including period before crisis, during time after crisis and time before crisis was studied by Singh & Sharma (2018) in the Indian context. They result they get after applying Johansens Co-integration test testified that was a long-term equilibrium connection among the variable in the crisis and before crisis period

but there was no relation in the after crisis phase. In the crisis phase, Sensex model and crude oil both showed long-term causality. They researcher was able to observe a one-way causality from Sensex and USD to the direction of crude oil; and from Sensex and gold towards USD. Therefore, the researcher inferred that linkage between elements of GODS is dynamic throughout international financial crisis.

Nakajima (2018) conducted a research which was in two parts. In first part he studied the Japans oil furniture market and investigated the risk transmission among the petroleum products and crude oil. In the second half, he compared performance of both tests for EGARCH and Granger Causality using Realized Variance. The outcomes of Realized Variance approach showed that the hypothesis related to mutual volatility existence between petroleum product markets and crude oil is accepted. Conventional approach outcomes showed that all hypotheses related to Granger Causalities in Variance were rejected. The high frequency approach showed higher power than daily data based conventional approach.

2.1 Islamic Equities

Herwany and Febrian (2013) checked whether financial stocks in Indonesia are protected from global financial distress. The study applied VAR framework and Co-integration tests and found that Sharia Compliant stock prices change less and are not much related with macroeconomics which makes them less risky and safe from financial distress. The same evidence was also observed by Shaista and Rizvi (2013) particularly for emerging markets and Asia Pacific by using continuous wavelet technique. Author concludes that Islamic indexes have proved themselves to be more stable because of rigid screening criteria. Dewandaru et al., (2014) incorporated the same technique to study the contagion among conventional equity indexes in five regions and Islamic indexes in the major crisis. A partial market integration and contagion based on fundamentals was observed throughout subprime crisis. After generalization of auto-regressive conditional hetroskedasticity (GARCH) family models by Mahjoub and Mansour (2014) showed low volatility

spillover among the emerging Islamic stock market and US stock market. The study conducted by Dimitris et al., (2016) observed presence of contagion effects through the financial crisis among Islamic stock market indexes of countries included in BRICS, EU, EMUM Dow JONES Sukuk Index.

Keeping in view the former literature, some researches have been carried out upon Islamic equity interdependence with different asset classes like precious metals, currency and commodity. Hussin et al., (2012) expresses his point of view that Islamic stock return in Malaysia and GCC responded in a positive manner to oil prices in most cases. In addition to this, Khan and Masih (2014) argued that correlation among Islamic equity and commodity change quickly and are extremely volatile. According to Nagayev et al., (2016) Islamic equity and crude oil have strong negative connection during 2001-2003 in high scale period. They also expressed that there is strong positive relation in the high and medium scales during 2007 and 2013. Zhang and Li (2016) claimed that rise in the correlation among equity and oil can be a long-term experience. Matadier and Boulila (2018) explored the casual linkage among oil, sukuk bonds and precious metals such as gold and silver prices in Asia pacific stretch.

Trablesi (2019) studied the inter-linkage of Islamic stock return volatilities among different classes of assets like gold, oil, and bonds; and different global markets such as APAC, GCC, UK, US and EU. They established few evidence on the time to time changing nature of the inter-linkage between regions while some spikes recorded during adverse market conditions. They reached to the conclusion that total volatility spillover from higher frequency plays a vital role in whole connectedness however the involvement from lowest frequency exist for a limited time. Islamic finance industry has quickly grown in last decade and has provided with amazing expansion for the Islamic bank operations and huge issuance of Islamic Shariah complaint financial instruments. Saiti et al., (2015) studied the period from 2007 to 2009 (subprime crisis period) and the downfall of Lehman brothers (2008) to decide whether correlation of the traditional stock market and US Islamic stock was getting to fundamental contagion or pure contagion. The outcome

is more focused through channels of financial contagion in the subprime crisis. On the other hand, Shariah compliant indices did not showed occurrence of contagion.

Boujelbene (2012) studied the volatility and performance of thirty-five Islamic indices and their opponents in the developed GCC and Emerging markets during June 2002 and April 2012. The researched included Capital Asset Pricing Model and Sharpe-ratio test for understanding adjusted risk accomplishment of indices of Islamic stock in comparison to standard indices. This study concluded that no difference in performance of both categories of indices which are conventional and Islamic during the period of crisis and tranquil period. Contrary to it, Arouri et al., (2013) argued that due to tough and strict screening process and altered fundamental structure of Islamic indices kept it safe during financial crisis. Abdullah et al., (2016) used Wavelet transformation approach and multivariate GARCH DCC model to study the influence of price of crude oil on Islamic stock indices of south east Asian countries. According to results, by supplementing portfolio with Islamic stock indices of Malaysian crude oil investor can gain more.

Karim et al., (2012) observed the 2008 financial crisis on Islamic equity market and Islamic banking during 2000 and 2011 in Malaysia. According to them variable of Islamic finance were interlinked with the important macroeconomics variables, which included exchange, inflation and exchange rate during period of crisis. By incorporating independent regression Mohanty et al. (2011) studies the connection among oil prices during and GCC stock market 2005 and 2009. According to their findings and return on stock market and price of oil were positively associated with each other except Kuwait. Mezghan & Boujelbene (2018) decided to explore the transfer of shock between conventional and oil market and Islamic stock market in the GCC (Gulf Cooperation Council) countries between 2008 and 2014 oil shocks. Generalized auto-regressive conditionally hetroskedasticity model and dynamic conditional correlation model for conventional, Islamic and oil market showed a substantial rise in the correlation through the period of turbulence during mid of 2008 to mid of 2014. The studied markets showed there is contamination among them. In addition to this, the author also checked the existence of dynamic correlation among oil return stock returns forecasting error for

conventional and Islamic indices of GCC. During 2014 oil crisis a huge increment in correlation coefficient was recorded between conventional Islamic GCC stock market and conventional stock market and oil and conventional stock market as well. After the 2008 financial crisis no change was observed in the correlation coefficient between GCC Islamic stock market and oil market. The previously discussed contagion and containment has been related to herding bias during oil crisis of 2014.

By including Islamic sectoral indices as comparative element in the literature of sectoral efficiency Alam et al., (2016) has managed to enhance this aspect of literature. If the short-term effect and performance, there is no difference observed related to Islamic and conventional stock market. Same has been observed when its based on long term effect but recently in last decade Islamic indices have managed to exhibit more efficiency in relation to their counterparts. At the end Alam et al., (2016) winded up the discussion with the conclusion that although both conventional and Islamic stock operate in same environment but the lower leverage associated with Islamic stock make them more stable, such aspect allows it to be more associated with weak form efficient market hypothesis. Efficiency on sectoral level of the both Islamic and conventional stock remains same and follows same pattern.

Wide expansion and acceptance of sukuk bond has made it a new entrant in the category of Halal Securities in non-Muslim and Muslim capital markets. Metadjer & Boulila, (2018) decided to study the causal linkage among valuable metals (like gold and oil), and Islamic bonds and oil in Asia Pacific. For this study daily data was used and further analyzed by VAR model. The relation between commodity market variables (silver, gold and oil) and sukuk bond was established on basis of results provided by granger casualty test and impulse response analysis. As compared to many previously carried out empirical studies this study does explain that there is no impact of oil on price of precious metal. There was no supporting evidence in the favor of the idea that Islamic financial market is safe due to diversification benefit from the risk of oil crisis.

Study carried out by Smith (2001) concluded that in short horizon correlation among Us stock indices and gold is very low and negative, in addition to this the correlation is different from zero insignificantly. According to traditional perspective there is a negative connection between stock market and oil. According to Kang (2012) commodities are known as effective portfolio diversifier. Akhtar et al., (2017) added that in the initial stage of financial crisis Islamic stocks are beneficial. Albaity (2011) explored the effect of monetary policy, the impact of interest rate and to deal with inflation the incorporation of stock market indices as hedge. He also studied the effect on two Islamic stocks caused by volatilities of interest rates, inflation rates and monetary variables. Results deduced from the GARCH (time series analysis) are: Albaity (2011) used the time Series analysis (GARCH) and investigated the impact of monetary policy variables, to hedge against inflation, by using stock market indices and the effect of interest rate. On two Islamic stock market indices he checked the volatilities of monetary policy variables, inflation and interest rates. The results of time series analysis (GARCH) are in uni-variate model of conventional indexes that monetary policy Variables (M1 and M3), inflation rate and real growth in GDP was significant and they are affecting volatility of KLSI, whereas monetary variables (M2 and M3), interest rates and inflation rates are influenced DJINA volatilities. He also examined the non-conventional side, results says in mean and variance equations the KLCI and DJIMI variances are affected by inflation rates and interest rates. In mean and variance equation KLSI is affected by M3 and the interest rate.

Kamarudin and Masih (2015) studied the connection among crude oil price and stock market. Under discussion study form a case study in which author selected conventional stock market and Malaysian Islamic stock market. Crude oil has been mostly included in portfolios and its frequent financialization justifies research of the linkage among stock market indices and crude oil on different time scales or different investment perspectives. Thus, this study uncovers the co-movements multi-horizon nature by applying wavelet decomposition. Moreover, this study also employed closing price of Malaysian Islamic stock indices, conventional stock indices and Brent crude oil. The results indicate existence of a weak correlation

between returns on Malaysian stock market and crude oil price both for long-term and short-term effect. But if especially long-term effect is observed it is visible that there is substantial correlation among stock market and crude oil linkage. Surprisingly, both type of market Islamic and conventional are highly correlated to each other and almost same trends are shown for crude oils price.

Karim and Maish (2019) researched the extent of re activeness Islamic stock returns against two type of volatility (implied and realized) of the prices of oil at a variety of investment opportunities. For the measurement of implied volatility of oil prices crude oil volatility index is applied. The data used for analysis was collected weekly between May 2007 and May 2017. The results from wavelet coherence analysis indicate that negative impact of the realized volatility of the price of oil on the returns from Islamic stock market is not as much as persistent in comparison with implied volatility on the basis of time as well as on scales. From the above outcomes it is safe to say that Islamic stock market is more responsive and reactive towards oil price implied volatility in comparison with realized volatility. The reason of implied volatility this much effective can be the inclusion of historical volatility related to oil spot prices and predicted volatility. These outcomes have great practical and policy implications.

A very important aspect related to Islamic stock market is not given due attention. Islamic stock market is well liked and especially favored by investor who are interested in sharia complaint markets. The majority of the investors involved in investment in Islamic stock market are Muslims and belong to oil producing countries (GCC). Most of the investors have profits from oil as main source of income. So, to be in accordance with sharia all the excess fund must be invested in sharia complaint markets. A popular option available to sharia compliant investors is to invest in sharia compliant markets. Thus, this indicates that whenever there is more revenue from oil more will be the investments in Islamic stock market. By using multi-timescale framework Jammazi et al., (2017) studied the time varying causal linkage between stock returns and change in oil prices in six oil importing countries. Their findings showed that for all the six countries involved in oil import there was a visible causal relation among stock market and oil which was in

both directions on variety of horizons of investment. Jawadi et al., (2014) reached to the conclusion that the Islamic stock market was not that much affected by 2008-2009 economic crises as other stock markets in other countries such as USA and Europe suffered.

A study was conducted in which China stock market was compared with Asia Islamic stock markets on the basis of volatility spillover. A sample from six indexes was collected from regions of Asia which were Korea, China, India, Malaysia, Thailand and Indonesia. This sample was collected through Morgan Stanley Capital International. McAleer et al., (2009) model (VARMA-BEKK-AGARCH) was used to study the spillover effect among different indexes from Asian Islamic markets. The bi-variate model included asymmetric and spillover effect. Results from this research showed that a negative return positively significant spillover exited between Asian Islamic stock market and China. Moreover, a volatility spillover on both directions existed between Islamic market of Korea, Thailand and China providing proofs of presence of temporary reliability on movements of Islamic Chinese stock market. Indonesia, India and Malaysia didnt have temporary volatility persistence. According to Majdoub & Sassi (2017) results from GARCH didnt expressed long-lasting volatility spillover persistence from Chinese stock market towards Korean, Indonesian and Indian Islamic stock market.

Majdoub et al., (2015) studied the integration existing in market among Islamic stock prices and conventional stock prices from two perspective; long term and short term, in USA, UK, France and Indonesia. The results from their research they concluded that there was very weak relationship among Islamic Indonesian market and developed countrys market. Results from this study guides investors to form a combination of diversified portfolios at international level to lower the risk. Balli et al., (2015) explored two decisive elements; volatility spillover and returns from MENA Region (Middle East & North Africa) and developed markets. They used trend & constant spillover models they found noteworthy spillover effect from markets which have matured and developed to underdeveloped markets. US shocks ability to dominate all developing market is clearly visible from results.

Rahim and Masih (2016) studied the advantage of portfolio of Islamic stock investors from Malaysia with global diversification with Islamic indexes of Thailand, USA, japan, Singapore and China. A time-varying technique was used by them which was based upon multivariate GARCH (Dynamic) Conditional correlation. The results indicate that Malaysian sharia investor may not be able to get benefits by investing in Singapore and China, but they can get benefits by investing in Thailand and Japan, but that benefit is limited to those who invest for 32 to 64 days. Results show that if the investor wants to get benefit from portfolio diversification it is better to invest in US stock market for a long-term investment.

Mishra et al., (2019) used daily data ranging from January 13th 1996 to April 13th 2018 and studies the connection between the down jones Islamic stock index and international crude oil prices. Effect of a variety of quantiles related to WTI Brent Crude Oil Price (time series) on quantile of Islamic stock index. The results of the research indicated the difference in the impact on the Islamic stock index by the international crude oil prices. The outcome of the study indicates that in the shorter run the oil prices have a positive effect on Islamic stock indices but when they attain the stability, they will negatively affect each other.

Arshad (2017) observed that the changes in oil prices and the Islamic stock market are parallel to each other, the reason behind this coinciding is the Islamic stock is based on actual economy which is openly venerable to fluctuation in oil prices. After observing a huge collection of individual Islamic stock Narayan et al., (2019) found that there is non-homogeneous impact of oil shocks on Islamic stock based on oil price sensitivity stems a yearly return ranging from 5.8% to 13.6%. Ftiti and Hadhri (2019) also established that Islamic stock returns can be anticipated by using lingering oil prices. Hassan et al., (2019) concluded that there is no correlation between oil prices and Islamic stock market in BRCIS. It was further established by Bahloul et al., (2017) that Islamic stock was granger caused by oil price.

In one study it also has been suggested to managers of Islamic funds to use

Bitcoin as a part of portfolio optimization strategy. In the study three appropriate and recent methods have been used, which are MODWT (Maximum Overlap Discrete Wavelet Transform), CWT (Continuous Wavelet Transform) and M-GARCH-DCC. The correlation between Islamic stock indices and Bitcoin are both very slightly and negatively correlated. Thus, the results clearly indicate that Bitcoin can be beneficial in diversification. This research also open avenues for further investigations to explore how Islamic capital market can grab benefit from other crypto currencies (Jin & Masih, 2017).

Malaysian case study was used by Najeeb et al., (2015) to assist investors with different investment horizons by observing dynamic movement of returns from Islamic returns and identifying diversification opportunities in international arena. To further statistically investigate three latest and suitable methods were incorporated MODWT (Maximum Overlap Discrete Wavelet Transform), CWT (Continuous Wavelet Transforms) and M-GARCH-DCC. The results show that for our sample market opportunities for diversification exist only in short-term. However, in longer run benefit from diversification are not much significant. The results from this research gave guidelines for strategy development for managing the ideal diversification combination.

Othman et al., (2013) studied the long-term relationship among the Islamic equity funds NAV and selected macroeconomic factors. In addition to this, they also investigated the effect on unit price of Islamic equity unit trust fund and their performance because of 2007-2008 international financial crises. The research incorporated monthly data for the period January 2006-December 2012 and used the VAR (Vector Auto-regression) Framework for analysis. The results of the study supported the claim that in Malaysian capital market macro-economic variables has long-term relation with NAV. Kumar and Sahu (2017) studied the short-term and long-term relation between returns on stock investments and macroeconomic indicators in India. The intent of researchers to use Islamic indices to study stock exchange of a non-Islamic country (India) make it unique. Monthly data was used collected from January 2006 to July 2015. The chosen macroeconomic indicators were exchange rate, money supply, interest rate and inflation rate. To test short

term and long-term equilibrium relationship VECM and Johansens co-integration was employed by the authors. Co-integration analysis was performed to check for the long-term equilibrium relationship. The study found a long-term equilibrium relationship between down Jones Islamic Indian market index and macroeconomic indicator. Moreover, stock returns and WPI were also statistically significant. This spree of significant relation doesnt end here, stock returns and money supply also have significant relation. The relation between stock returns and interest rate was significant statistically and in negative direction. Towards Dow Jones Islamic Indian Market Index exchange rate and money supply showed casualty in only one direction. It can also be said that money supply and exchange rate granger cause Dow Jones Islamic Indian Market Index.

Othman et al., (2015) used Granger causality test and VECM to study the causal linkage between chosen macroeconomic indicators of Malaysia and net asset value of fund (Islamic unity trust fund). The study focused to solve the problem by exploring the causal linkage among NAV (Islamic Equity Fund) and macroeconomic indicators such as financial crisis, corruption index, political election, money supply, price index and production index. The author concluded that financial crisis, production index and election had only one direction causal linkage with NAV. From the findings it can be said that with respect to production index, financial crisis and election Malaysian industry of equity unit trust fund is an inefficient market. Vejzagiv and Zarafat (2013) studied by using co-integration analysis, the long run equilibrium linkage among FTSE Bursa Malaysia Hijrah Sharia Index and selected macroeconomic indicators. This paper revolves around Hijrah index and important macroeconomics indicators for a data collected for 72 months. FBMHS has been designed in such a way that it passes the strict screening process and fulfils the criteria required for Islamic investors. Vital macroeconomic indicators such exchange rate, price index, money supply and interest rate were affected by FBMHS.

Rashid et al., (2014) studied the effect on Islamic stock index caused by investor sentiments in Malaysia. This study investigates the extent to which conventional and Islamic stock market impact the macroeconomic factor and investor sentiment

index. Two different models are tested by researchers in this study, in one model researcher used macroeconomic indicators in a framework of time series based on quarters and the other model used same framework but included sentiment index data as well. By using Hijrah Index as predicted variable and numerous indicators from macroeconomic, conventional and behavioral domain researchers explored the asset prices in Malaysian Islamic stock market. The outcome of the researcher gave clear indication of greater impact on Islamic price index caused by FTSE Bursa Malaysia Composite Index, currency index and interest rate. On the other hand, price index, monetary supply, industrial production and sentiment indices had lower effect on Islamic price index.

Alexakis et al., (2016) studied long term linkage among conventional equity indices and Islamic equity indices between 2000-2014. In order to explore bidirectional movement in market (upward and downward) author has decomposed the series into negative and positive segments by using a unrevealed technique. Bidirectional dynamics proofs were explored while downward, upward and mixed market movements. Miniaoui et al., (2015) investigated the Islamic indices and conventional indices of GCC (Gulf Cooperation Council) as a result of financial crisis in 2008 and checked whether Islamic indices were less venerable and open to risk than conventional indices. Two set of data were incorporated for this purpose. One was six GCC market data and the other was Dow Jones Islamic Market Index for GCC. By using augmented GARCH models every index was analyzed for variance and mean. According to results, Bahrain was only country, which was affected due to financial crisis, mean returns were affected in this case. All other indices remained unchanged. Volatility of market of three GCC countries was affected which are UAE, Bahrain and Kuwait. Markets of Saudi Arabia, Qatar, Oman and Islamic Index was not affected and remained unchanged. Interestingly Islamic indexs volatility was not lower than conventional Islamic indexs volatility.

Albaity (2011) explored the affect of policy variable, impact of rate of interest and utilization of stock market index to deal with inflation. This study also observes impact on two indices of Islamic stock market caused on the volatilities of inflation rate, monetary variable and interest rate. The author used GARCH for

time series analysis and got these results: KLCI volatility was affected by variance (uni-variate model) of conventional indices which are growth in GDP, M3, M1 and inflation rate. Moreover, DJINA volatility was affected by M3, M2, inflation and interest rate. In addition to this, inflation rate and interest rate in the variance and mean equation impacted DJMI, multivariate model. On the contrary, in the variance and mean equation was affected by inflation rate and M3.

Nordin et al., (2014) explored the effect on performance of Malaysian stock market caused by interest rate, commodity prices such as gold, oil and palm and exchange rate. Author used bound test approach and results stated that there was co-integrating linkage between variables. Importantly, stock market index was significantly affected by palm oil price. though there was no affect recorded for both gold and oil prices. Keeping itself aligned with precedent of past data-based studies exchange and interest rate exhibit notable impact. Results originated from this study have policy guidelines for authorities that they should focus on price of commodities and macroeconomic indicator because they have a strong influence on Malaysian stock market. Abdullah et al., (2014) to test scale dependent volatility and time varying volatility and correlation among the chosen Islamic stock indices related to countries in South East Asia and commodities in order to get maximum benefit from portfolio diversification. Wavelet decomposition and dynamic conditional correlation were two methodologies which were most appropriate to be used in order to achieve the objectives of study. In the light of the findings of study it is safe to say that a theoretical linkage exists among the chosen commodities and Islamic stock indices. Moreover, Islamic stock indices from Indonesia, Philippines and Singapore are performing best in comparison with other Islamic stock markets. The application of MODWT also validated previously discussed results that Singapore Islamic stock market is dominating in Islamic indices and commodities. On the basis of getting maximum benefits out of portfolio diversification by dynamic correlation among variables, the results exhibit that investor should be informed about the short-term low correlation between crude oil and Islamic stock index of Philippines. This is on the basis of evidences collected from continuous wavelet transform analysis and in order to gain the investor holding

crude oil must invest in Malaysian Islamic stock market and make it part of his portfolio. This suggestion is on the basis of evidence from dynamic conditional correlation analysis.

2.2 Hypotheses Development

H_1: There exist long term relationship between crude oil and the Islamic equity indices.

H_2: There exist short term relationship between crude oil and the Islamic equity indices.

H_3: There exist long term relationship between Gold prices and the Islamic equity indices.

H_4: There exist short term relationship between Gold prices and the Islamic equity indices.

H_5: There exist time varying correlation exit between crude oil and Islamic equity indices.

H_6: There exist time varying correlation exit between Gold Prices and Islamic equity indices.

Chapter 3

Data Description & Research Methodology

3.1 Population & Sample Of Study

In this study daily stock indices of Islamic Equities of 9 countries have been used.In this study the main focus was on emerging markets. Non-Conventional markets have been targeted in this study. Dow Jones indices have been used for the analysis. The observed data ranges from 2009 to 2019. The individual Islamic Equity indices have been acquired from the Dow Jones. The daily data has been used in this study. The Dow Jones Islamic Market creates indices of Islamic countries, who trade Islamic indices. It has independent supervisory setup. They create their indices by taking help of Accounting and Auditing Organization for Islamic Financial Institutions. They observe the performance of Shariah Complainant equities and make the indices on the basis of some specific measures.

The names of indices that will be taken for study are given below:

1. Dow Jones Islamic Market Canada Index
2. Dow Jones Islamic Market India Index
3. Dow Jones Islamic Market Japan Index

4. Dow Jones Islamic Market Kuwait Index
5. Dow Jones Islamic Market Malaysia Index
6. Dow Jones Islamic Market Sri Lanka Index
7. Dow Jones Islamic Market Turkey Index
8. Dow Jones Islamic Market U.K. Index
9. Dow Jones Islamic Market China/Hong Kong Titans 30 Index

3.2 Econometric Models

This study explains the connections in terms of Co-integration and correlations between volatility of Oil prices, Gold prices with Islamic Equity indices; we used Global Oil prices, Gold prices, and Islamic Equity indices. For this purpose we will use Johansen Co-integration and DCC GARCH to investigate the connections.

3.2.1 Johansen Co-integration Approach

The Johansen co-integration tells us about two series X and Y are non-stationary but the linear combination of these series is stationary then we can say X and Y are co-integrating vectors. It is a maximum likelihood method through which we can find the number of co-integrating vectors in non-stationary time series. Johansens estimation model is as follows:

$$\Delta X = \mu + \sum_{i=t}^{r} \Gamma \Delta X_{t-\acute{t}} + \alpha \acute{\beta} X_{t=i} + \epsilon \tag{3.1}$$

X = (n x 1) it denotes all including non-stationary vector

Γ = (n x n) coefficients of the matrix

α = (n x r) it denotes the coefficients of the error correction matrix. In this r is the number of those variables which has co-integrating relationship, so that it should meet this requirement 0 <r <n. it is also known as adjustment parameter

and estimates the speed of adjustment on which their equilibrium made.
β = (n x r) it is a matrix of r co-integrating vectors, in which 0 <r <n. This presents the co-integrating long term relationship between these variables.

There are two different statistical tests for co-integration is defined by Johansen (1991). The first test is trace test and the other test is Maximum Eigenvalue Test. Trace test is test in which Null Hypothesis is tested which says that there is no co-integration (H_0: r = 0) between the series against the alternative hypothesis which say there exist co-integration (H_1: r <0). The second statistical test of Johansen (1991) is Maximum Eigenvalue test which checks the each eigenvalue separately. Maximum Eigenvalue test checks the Null Hypothesis that No. of co-integrating vectors is equal to r and its alternative hypothesis is No. of co-integrating vectors are r+1 (Brooks, 2008).

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1 - \hat{\lambda}_i) \tag{3.2}$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{3.3}$$

r = it denotes that how many co-integrating vectors do exist under the Null Hypothesis
$\hat{\lambda}_i$ = It calculates ith ordered of eigenvalue from the $\alpha\acute{\beta}$ matrices.
If there is a significant non zero eigenvalue exit then it is an indication of significant co-integrating vector.

3.2.2 Time-Varying Conditional Correlation - DCC and ADCC

Dynamic conditional correlation DCC GARCH model is used and possibility of any asymmetry in the model will be captured by ADCC GARCH model. Dynamic Conditional Correlation model or DCC, models the volatilities and correlations in two steps. The detail about the dynamics of correlation is reached out to permit asymmetries vital for financial practice. The DCC furnishes a joint thickness

work with tail dependence more prominent than the ordinary. This is investigated both by simulation and experimentally. The time aggregated DCC is exhibited as a valuable copula for financial decision making. At the point when two stocks move same way, the correlation is expanded marginally. On the opposite side, when similar two stocks move inverse way, this correlation is diminished. In down markets, this eect of movement of stocks can be stronger. The correlations often are assumed to only temporarily deviate from a long run mean. A symmetric DCC model gives higher tail dependence for both upper and lower tails of the multi-period joint density while, an asymmetric DCC or ADCC gives higher tail dependence in the lower tail of the multi-period density.

DCC is defined as ...

$$Q_t = \overline{R} + \sum_{i=1}^{m} \pi_i(\epsilon_{t-i}\epsilon_{t-i}^{'} - \overline{R}) + \sum_{i=1}^{m} \xi_i(Q_{t-1} - \overline{R}) \tag{3.4}$$

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

ADCC is defined as ...

$$\sigma_t = min(\epsilon_t, 0), \overline{N} = \frac{1}{T}\sum_{t=1}^{T} \sigma_t\acute{\sigma_t} \tag{3.5}$$

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

$$\mu\sigma_{i,t}\sigma_{i,t} \tag{3.6}$$

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

$$G(\sigma_t\acute{\sigma_t} - N) \tag{3.7}$$

3.3 Descriptions of Variables

3.3.1 Crude Oil

Crude oil is a liquid fuel source and it comes from the underground. After refining it is used as fuel in vehicles, machinery, fertilizers and other petroleum products. Crude oil prices measure the spot price of different barrels of oil in which WTI (West Taxes Intermediate or the Brent Blend are most common. WTI crude oil is very high quality oil because it contains low quantity of sulfur, light weight and sweet oil while Brent Blend is a combination of 15 different crude oil; it is less light and sweet than WTI.

The current study has employed daily data of crude oil for the period of 2009 to 2019 and the data is collected from S&P GSCI OIL.

$$Daily\ index\ return = \ln\left(\frac{CU_t}{CU_{t-1}}\right) * 100 \tag{3.8}$$

To make value bigger multiplies with 100.

Where,
ln = Natural Log
CU_t = Current index price of crude oil
CU_{t-1} = Previous index price of crude oil

3.3.2 Gold

Gold is a very precious metal, it is in yellow color, it is use to make jewellery and different ornaments and it is valued in international currency. From the last decades (e.g. from 2000) volume and revenues from Gold production rose remarkably. There is a remarkable growth comes into the Gold Market when its price rose from almost USD 300/oz in starting of 2002 to USD 1400/oz in last 2010. In September 2011 it reached its higher record of USD 1900/oz. The current study

has employed daily data of gold for the period of 2009 to 2019 and data is collected from S&P GSCI GOLD.

$$Daily\ index\ return = \ln\left(\frac{GO_t}{GO_{t-1}}\right) * 100 \tag{3.9}$$

To make value bigger multiplies with 100.

Where,

ln = Natural Log

CU_t = Current index price of Gold

CU_{t-1} = Previous index price of Gold

3.4 Islamic Equity Indices

The Islamic equity market is a market in which Shariah compliant securities are exchanged. The basic purpose of Shariah Compliant securities are that these securities are designed on the basis of Shariah Compliant rules. Stocks of Joint Stock Companies are used to invest the amount of Islamic Shariah equities. Most of the time there profit is based upon the Capital gain; Capital gain means if the price of stocks increases. And profit is also made through dividend distributions. The current study has employed daily data of Islamic equities for the period of 2009 to 2019 from Dow Jones Islamic Market index.

Chapter 4

Results & Discussion

4.1 Descriptive Statistics Of 6 Years

First of all behavior of data will be examined through the Descriptive statistic. Descriptive statistics of each variable e.g. dependent and independent variable will be checked. Here Gold and Oil are dependent variable and rest of all are independent variables. In the Table of four main things will be seen i.e. Mean, Variance, Skewness and Kurtosis. Moreover the spread of data is also assessed by Maximum & Minimum average responses. In this study daily data has been used and the data range is between 2009 to 2019.

Table 4.1: Descriptive Statistics Of 6 Years

	Mean	**Maximum**	**Minimum**	**SD**	**Skewness**	**Kurtosis**
OIL	-0.0002	0.1341	-0.1079	0.0177	0.0828	9.0634
GOLD	0.0000	0.0461	-0.0981	0.0078	-0.8560	18.7367
CAN	0.0000	0.0473	-0.0493	0.0086	-0.1399	6.8265
UK	0.0001	0.0544	-0.1003	0.0082	-0.8382	17.3677
IND	0.0002	0.0475	-0.0719	0.0078	-0.5360	9.8352

This table covers the descriptive statistics for the series Gold prices, Oil Prices and Islamic equity indices. Useable observations for this study are 2412.

Table 4.1 exhibits descriptive statistics. The average daily oil returns in the Goldman Sachs Commodity Index (GSCI) are -0.000220. The maximum daily prices

of oil in Goldman Sachs Commodity Index (GSCI) are 0.134185and the minimum price is -0.107958. The value of oil Kurtosis is 9.063499which is not equal to 3 that means data is not normally distributed. Data is not flatted or its leptokurtic (peaked curve) and Skewness is 0.082846 which means data is long right tailed. The average Gold returns in the Goldman Sachs Commodity Index (GSCI) are 0.000036. The highest daily value of Gold returns is 0.046103and the lowest price is -0.098112. The data of gold price is platykurtic (flatted curve) and long right tailed. The average daily returns of Canadian Islamic market are 0.0000214. It reached at maximum value of 0.047322which is pretty good and it has touched a lower level of -0.049319. The shape of data is platykurtic and long right tailed. The average daily returns of UK and India are 0.0000698and 0.000229respectively. The shape of these both series is platykurtic and right tailed.

4.2 Descriptive Statistics Of 10 Years

First of all behavior of data will be examined through the Descriptive statistic. Descriptive statistics of each variable e.g. dependent and independent variable will be checked. Here Gold and Oil are dependent variable and rest of all are independent variables. In the Table of four main things will be seen i.e. Mean, Variance, Skewness and Kurtosis. Moreover the spread of data is also assessed by Maximum & Minimum average responses. In this study daily data has been used and the data range isbetween 2009 to 2019.

Table 4.2 exhibits descriptive statistics for 10 years. The average daily gold returns in Goldman Sachs Commodity Index (GSCI) is 0.0000638. The gold prices reached at maximum value of 0.076095and they plunged the minimum value of -0.105047. The shape of data is leptokurtic (peaked curve) and it is negatively skewed. The daily mean value of oil prices is 0.0000902and they touched a highest level of 0.134185 and lowest level of -0.107958. Kurtosis is 8.976420which is not equal to 3(K3), which indicates that data is not normally distributed. The data of oil is leptokurtic (peaked curve) and negatively skewed. The average returns of Japan, Kuwait and Sri Lanka are 0.000226, 0.0000698and 0.0000416 respectively. The

TABLE 4.2: Descriptive Statistics Of 10 Years

	Mean	**Maximum**	**Minimum**	**SD**	**Skewness**	**Kurtosis**
OIL	0.0001	0.1341	-0.1079	0.0168	0.0205	8.9764
GOLD	0.0001	0.0760	-0.1050	0.0087	-0.9932	20.3227
JAP	0.0002	0.0748	-0.0797	0.0098	-0.4024	11.0442
KAW	0.0001	0.0581	-0.0632	0.0079	-0.7566	12.2650
SRI	0.0000	0.0749	-0.0519	0.0075	0.9333	14.2040
TUR	0.0002	0.0525	-0.0822	0.0095	-0.6909	9.3672
CH	0.0001	0.0625	-0.0569	0.0094	-0.3363	8.0635

This table covers the descriptive statistics for the series Gold prices, Oil Prices and Islamic equity indices. Useable observations for this study are 3658.

data shapes of japan and Kuwait are leptokurtic (peaked curve) and left tailed, but data shape of Sri Lanka is right tailed. The mean value of Turkey and China in Islamic Market are 0.000240and 0.000101. Data of Turkey and China is leptokurtic (peaked curve) and left tailed (negatively skewed).

After checking the descriptive statistics now the stationary of data will be checked through unit root test. ADF test and Phillips-Person test will be examined for this. In this the trace test and Egan-value test hypothesis will be examined in this study. If a financial time series turns stationary after the first difference, then that financial time series can be called as integrated to order one. Moreover, statistically it is represented by I(1). For co-integrated data streams both series have to be integrated with order one and the linear combination of both of them without the requirement of differencing must be stationary.

4.3 Unit Root Test

If a financial time series turns stationary after the first difference, then that financial time series can be called as integrated to order one. Moreover, statistically it is represented by I(1). For co-integrated data streams both series have to be integrated with order one and the linear combination of both of them without the requirement of difference must be stationary. In this study firstly the stationary

Table 4.3: Unit Root Test

Unit Root Test	**ADF Level**	**ADF-1st Diff.**	**PP-Level**	**PP-1st Diff.**	**Integration Order**
GOLD	-2.1975	-62.6882	-2.0894	-62.7681	I(1)
	(0.4903)	(0.0001)	(0.5510)	(0.0001)	
OIL	-2.0579	-64.5856	-2.0569	-64.5857	I(1)
	(0.5686)	(0.0001)	(0.5692)	(0.0000)	
JAP	-2.6023	-62.2886	-2.5089	-62.3624	I(1)
	(0.2793)	(0.0000)	(0.3237)	(0.0000)	
SRI	-1.6467	-58.009	-1.8126	-58.5521	I(1)
	(0.7743)	(0.0001)	(0.6987)	(0.0001)	
TUR	-3.3422	-60.5566	-3.4189	-60.5587	I(1)
	(0.0597)	(0.0001)	(0.0490)	(0.0000)	
KAW	-1.1571	-60.8554	-1.2945	-60.9921	I(1)
	(0.9177)	(0.0001)	(0.8889)	(0.0001)	
CH	-3.0234	-60.783	-2.9375	-60.9045	I(1)
	(0.1258)	(0.0000)	(0.1506)	(0.0000)	
GOLD	-3.7229	-52.1965	-3.7379	-52.1039	1(1)
	(0.0210)	(0.0000)	(0.0201)	(0.0000)	
OIL	-1.4609	-53.796	-1.5186	-53.6516	I(1)
	(0.8426)	(0.0001)	(0.8233)	(0.0001)	
CAN	-1.7984	-47.4205	-1.8779	-47.4163	I(1)
	(0.7055)	(0.0001)	(0.6656)	(0.0001)	
IND	-2.1948	-47.2423	-2.298	-47.2485	I(1)
	(0.4917)	(0.0001)	(0.4343)	(0.0001)	
UK	-2.4798	-26.9495	-2.2966	-50.4348	I(1)
	(0.3382)	(0.0000)	(0.4351)	(0.0001)	

of data set has been checked. To check the stationary of data ADF test for unit roots test has been used and stationary was checked at level and first difference. Above table shows the results of ADF Test (Augmented Dickey-Fuller). The results shows that these time series are stationary at 1st difference these are not stationary at level. The 1st difference of the logarithmic transformations of series is stationary. So it has been concluded that theses series are integrated to the order one which can be denote as I(1).

Error term must have two properties which are hetroskedasticity and statistical independence in order fulfills the requirements of Dickey-Fuller test. There are chances of these assumptions not being true in case of some data. To handle such situation there is another test to check time series stationary known as Phillips-Person test. By analyzing Table-3 it is safe to say that the results from Phillips-Person test were reinforced by ADF test. So the series being order one can be declared I(1).

After fulfilling the requirements now co-integration analysis can be performed. In a set of non-stationary time series, the existence of co-integration equation is determined by using procedure by Johansen-Juselius (1990) and Johansen (1988, 1991) test. For hypothesis testing trace statistics has been used, which tests null hypothesis (R co-integrating Vectors) against alternative hypothesis (R or more co-integrating vectors).

As we met the conditions of Johansen-Juselius test so now we can do co-integration analysis. We can perform likelihood-based Johansen (1988, 1991) test and Johansen-Juselius (1990) in our analysis. We will use the procedures of likelihood-based Johansen (1988, 1991) test and Johansen-Juselius (1990) to find out the presence co-integrating equations in a set of non-stationary time series. We will use Trace Test to test the null hypothesis of r co-integrating vectors against alternative hypothesis of r or more co-integrating vectors. The table below shows the results of co-integration test for the sample period of 10/2009 to 11/2019.

For 10 Years: LGOLD = LJAP LCH LKAW LSRI LTUR

4.4 Trace Test

TABLE 4.4: Trace Statistics

Hypotheses	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None	0.0125	112.2197	117.7082	0.1057
At most 1	0.0073	66.0429	88.8038	0.6607
At most 2	0.0059	39.2343	63.8761	0.8723
At most 3	0.0030	17.5345	42.9152	0.9895
At most 4	0.0012	6.2707	25.8721	0.9976
At most 5	0.0004	1.7433	12.5179	0.9821

Trace test indicates no co-integration at the 0.05 level.

The above table was not able to reject the Null Hypothesis which says that there is no co-integration between gold and Islamic equities for the time period of 10/2009 to 11/2019 in world Islamic equity markets. The trace test explains the presence of no co-integration equation at the level of 0.05. Therefore the results of above table indicate that there is no long term relationship between gold prices and Islamic Equity Markets. However, it must be noted here that the Johansen co-integration tests do not account for structural breaks in the data.

4.5 Vector Auto-regression

Vector Auto-regressive model tells us about the lag impact of series. In the above we can see that Gold has 1 period lag impact. That means it affects itself in one lag. If we see the value of DLCH which is greater than 1.96 that means Chines market has lag impact on the Gold market. So we can say Dow Jones Islamic Market China Index has two lag impacts on gold market. Value of LCH3

is also greater than 1.96 which means our Hypothesis is accepted which says that Dow Jones Islamic Market China Index has 3 periods lag impact on Gold Market. DSLRI 2 also has lag impact on Gold Market.

TABLE 4.5: Vector Auto-regression

	D(LGOLD)
D(LGOLD(-1))	-0.0408
	(0.0166)
	[-2.4558]
D(LCH(-2))	0.0627
	(0.0177)
	[3.5304]
D(LCH(-3))	0.0359
	(0.0176)
	[2.0307]
D(LSRI(-2))	0.0488
	(0.0193)
	[2.5222]
C	0.0000
	(0.0001)
	[0.4491]

4.6 Variance Decomposition Of D(LJAP)

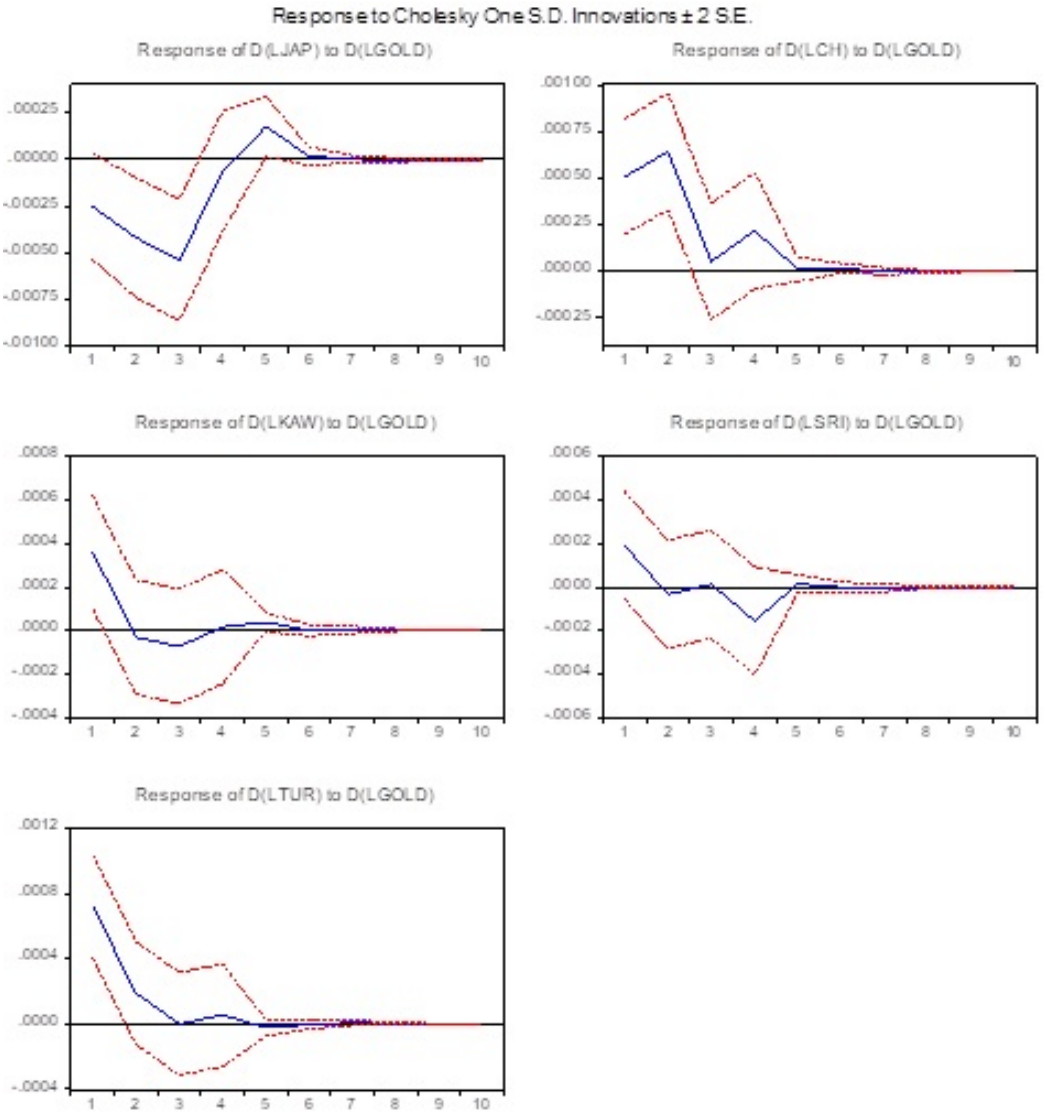
To see involvement of every source of innovation in foreseeing each variables error variance in communicated by variance decomposition analysis. So here we have applied the Variance Decomposition analysis to estimate that which shock to Gold prices are explained by the S&P Japan 500 Shariah Index, S&P Kuwait Shariah index, Dow Jones Islamic Market Sri Lanka Index, Dow Jones Islamic Market Turkey Index, Dow Jones Islamic Market China Index. Variance Decomposition analysis also tells the pattern of linkage between Gold prices and S&P Japan 500 Shariah Index, S&P Kuwait Shariah index, Dow Jones Islamic Market Sri Lanka Index, Dow Jones Islamic Market Turkey Index, Dow Jones Islamic Market China Index and it also improve our understanding into the reaction of markets to system wide shocks.

The below mentioned table of variance decomposition shows the variations in Gold market due to the other countries. If we see the 1st figure of Gold so we can say that 0.08576 variations come into the gold market by itself and 99.91424 variation come into the Gold market through Japan. So we can say that variation in Gold market comes through Japan if something will be happen in Japanese market it will affect the Gold market. So we can say that Japanese market is not efficient. In the second period almost 80% variation comes into the gold market due to the Islamic Market of Japan and 20% variation come through Islamic Market of China. So it has been concluded that Variation in Gold Market do not come through its own market it comes through other markets.

Table 4.6: Variance Decomposition Of D(LJAP)

Period	**S.E.**	**D(LGOLD)**	**D(LJAP)**	**D(LCH)**	**D(LKAW)**	**D(LSRI)**	**D(LTUR)**
1	0.0087	0.0857	99.91424	0.0000	0.0000	0.0000	0.0000
2	0.0087	0.2515	78.9434	20.1937	0.0228	0.0666	0.5217
3	0.0087	0.5492	77.7030	20.0546	0.0580	0.0688	1.5662
4	0.0087	0.5533	77.6623	20.0460	0.0582	0.0702	1.6098
5	0.0087	0.5847	77.6019	20.0434	0.0610	0.0720	1.6367
6	0.0087	0.5851	77.5997	20.0438	0.0611	0.0729	1.6372
7	0.0087	0.5851	77.5992	20.0441	0.0612	0.0729	1.6372
8	0.0087	0.5851	77.5991	20.0441	0.0612	0.0729	1.6372
9	0.0087	0.5851	77.5991	20.0441	0.0612	0.0729	1.6372
10	0.0087	0.5851	77.5991	20.0441	0.0612	0.0729	1.6372

4.7 Impulse Response



The purpose of Impulse Response is to show the response of a dependent variable over time to a given innovation. In above table we will see the response of S&P Japan 500 Shariah Index, S&P Kuwait Shariah index, Dow Jones Islamic Market Sri Lanka Index, Dow Jones Islamic Market Turkey Index, Dow Jones Islamic Market China Index to Gold Market. The above figure shows the impulse response of Gold market from a one standard deviation shock to Japanese market. As we can see the uncertainty in Japanese market, and in this period Gold market does not capture the response of Japanese market. The statistical significance of the impulse response function has been examined at 95% confidence bounds. From this statistical significance of the impulse response function we can say that one

standard deviation change in Japanese market leads to a decrease in Gold market. Similarly in Chines market if one standard deviation changes in Chines market leads to decrease in Gold market. We can conclude that S&P Kuwait Shariah index, Dow Jones Islamic Market Sri Lanka Index, Dow Jones Islamic Market Turkey Index, are more efficient than the S&P Japan 500 Shariah Index, Dow Jones Islamic Market China Index because there is high uncertainty in Japanese and Chines market.

For 10 Years: LOIL = LJAP LCH LKAW LSRI LTUR

4.8 Trace Test

Table 4.7: Trace Statistics

Hypotheses	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None	0.0077	85.5381	107.3466	0.5405
At most 1	0.0060	56.9176	79.3414	0.6890
At most 2	0.0049	34.6606	55.2457	0.7780
At most 3	0.0030	16.6908	35.0109	0.8850
At most 4	0.0012	5.5728	18.3977	0.9001
At most 5	0.0002	1.0866	3.8414	0.2972

Trace test indicates no co-integration at the 0.05 level.

In above table we check the co-integration between oil and Islamic equities for the time period of 10/2009 to 11/2019 in world Islamic equity markets. As we see that there is no co-integration in these series means that our null hypothesis is accepted which indicates that there is no co-integration between these series. The trace test explains the presence of no co-integration equation at the level of 0.05. . Therefore the results of above table indicate that there is no long term relationship between Oil prices and Islamic Equity Markets like Islamic Market of

Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China.

4.9 Vector Auto-regression

Table 4.8: Vector Auto-regression

	D(LOIL)
D(LOIL(-1))	-0.0694
	(0.0169)
	[-4.1001]
C	0.0000
	(0.0002)
	[-0.2624]

Vector auto-regressive model tell the evolution of a set of dependent variables over the same period as a linear function of only on their lag values. Here we checked the vector Auto-regression between series of Oil and Islamic Equities like Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China. The above table shows that oil has 1 lag impact on its own market because the t-value is greater than 1.96 which means it is significant.

4.10 Variance Decomposition Of D(LJAP)

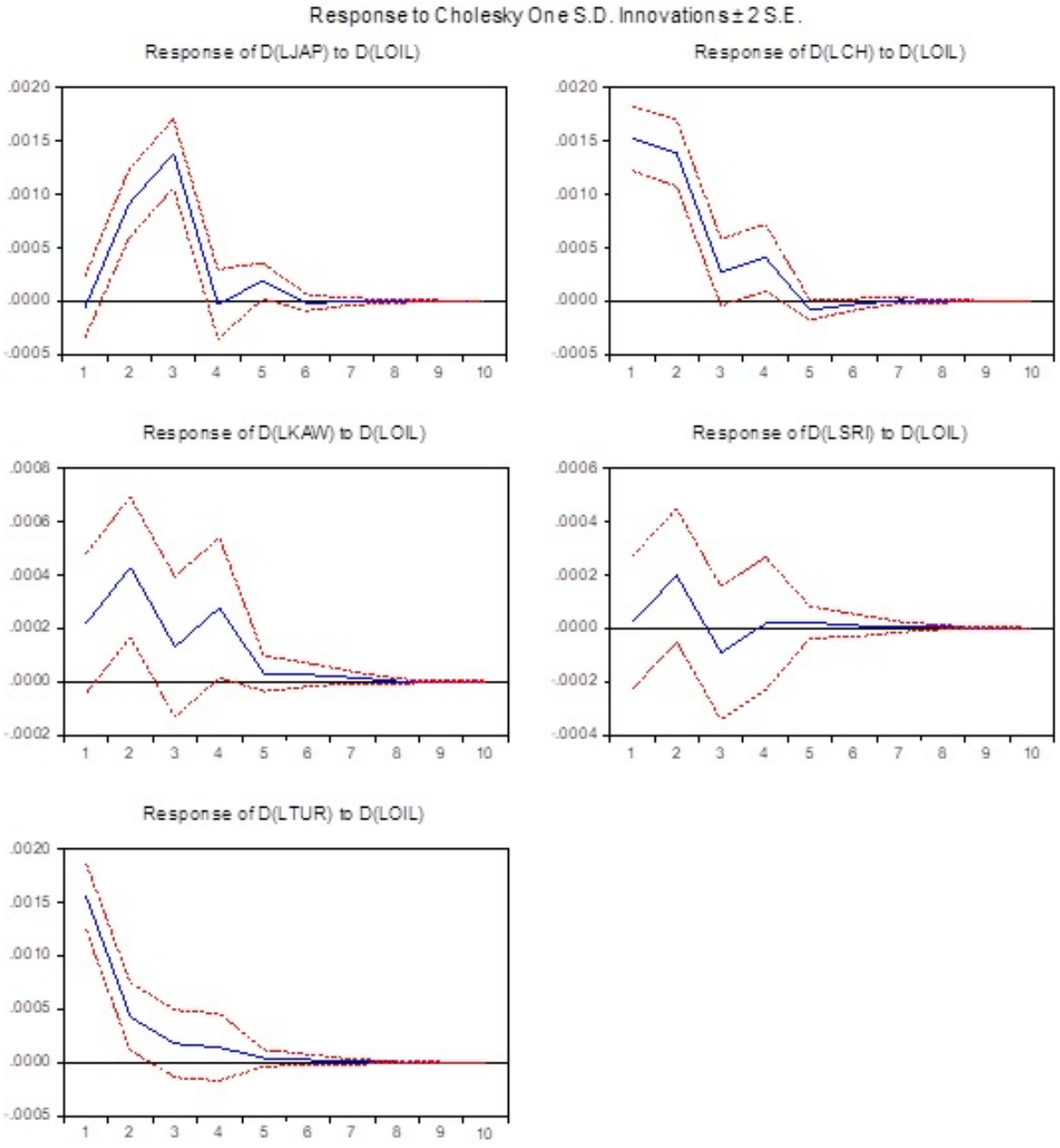
In the table below we investigate the involvement of every source of innovation in forecast each variables error variance in communicated by variance decomposition analysis. We apply the Variance Decomposition analysis to estimate that which shock to Oil prices are explained by the S&P Japan 500 Shariah Index, S&P Kuwait Shariah index, Dow Jones Islamic Market Sri Lanka Index, Dow Jones Islamic Market Turkey Index, Dow Jones Islamic Market China Index.

From the above below mentioned we can see that almost 80% variation in Oil market come from the S&P Japan 500 Shariah Index and 17% variations come from the Dow Jones Islamic Market China Index and almost 3% variations come from its own market. So we can say that Japanese market is less efficient the risk and return of S&P Japan 500 Shariah Index will affect Oil market most.

Table 4.9: Variance Decomposition Of D(LJAP)

Period	**S.E.**	**D(LOIL)**	**D(LJAP)**	**D(LCH)**	**D(LKAW)**	**D(LSRI)**	**D(LTUR)**
2	0.0168	0.8863	80.9139	17.6978	0.0131	0.0620	0.4266
3	0.0169	2.8438	78.7240	17.2437	0.0335	0.0638	1.0908
4	0.0169	2.8425	78.6890	17.2344	0.0341	0.0659	1.1338
5	0.0169	2.8779	78.6462	17.2268	0.0376	0.0659	1.1455
6	0.0169	2.8780	78.6458	17.2266	0.0377	0.0660	1.1455
7	0.0169	2.8781	78.6456	17.2267	0.0377	0.0661	1.1455
8	0.0169	2.8781	78.6456	17.2267	0.0377	0.0661	1.1455
9	0.0169	2.8781	78.6456	17.2267	0.0377	0.0661	1.1455
10	0.0169	2.8781	78.6456	17.2267	0.0377	0.0661	1.1455

4.11 Impulse Response



Impulse response tells us the reaction of dependent variable over the time to a given innovation. The above graph shows the responses of Islamic Shariah Indices on the Oil prices. As we can see in above figure we see the response of S&P Japan 500 Shariah Index on Oil Prices, it indicates that in Japanese Market response of oil prices is very high and then it come down and then it became smooth. The

above figure shows the impulse response of Gold market from a one standard deviation shock to Chines Market. Response of D(LCH) to D(OIL) figure shows that response Chines market to the Oil Market which was in decline, it could be reactionary period in which Oil market could not be able to capture the response of Chines Market. As we know the statistical significance of the impulse response function has been examined at 95% confidence bounds, by keeping in view this statistical significance of the impulse response function we can say that one standard deviation change in Turkish market leads to a decrease in Oil market. Oil market did not capture the response of Sri Lanka Market for a certain period of time after that there is smooth pattern was followed between Oil Market and Turkish Market.

For 6 Years: LGOLD = LCAN LIND LUK

4.12 Trace Test

Table 4.10: Trace Statistics

Hypotheses	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.0103	50.8224	55.2457	0.1160
At most 1	0.0046	25.6641	35.0109	0.3456
At most 2	0.0038	14.5137	18.3977	0.1607
At most 3 *	0.0021	5.1092	3.8414	0.0238

Trace test indicates no co-integration at the 0.05 level.

The above table did not reject the Null Hypothesis which says that there is no co-integration between gold and Islamic equity indices for the time period of 10/2013 to 11/2019 in world Islamic equity markets. The results of Trace test shows there is no co-integration equation at the level of 0.05 so we can say we cannot make any combination of series which is stationary. Therefore the result indicates that there is no co-integration in long term between Gold Prices and Islamic Shariah Equity indices. However, it must be noted here that the Johansen co-integration tests do

not account for structural breaks in the data. Now we will see this relationship via Vector Auto-regression, variance decomposition and Impulse response.

4.13 Vector Auto-regression

Table 4.11: Vector Auto-regression

	D(LGOLD)
D(LGOLD(-1))	-0.0789
	(0.0210)
	[-3.7473]
D(LCAN(-1))	0.0731
	(0.0228)
	[3.2015]
C	0.0000
	(0.0001)
	[-0.1577]

In the above table shows results of Vector Auto-regression in which we see the lag relation between the gold prices and the Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index. In the above table we see the value of D(LGOLD(-1)) is 3.7473 which is greater than 1.96 that means there is 1 lag impact of Gold prices on its own market. The value of D(LCAN(-1)) is 3.2015 which is greater than 1.96 and t-value is significant which indicates that 1 lag impact of Canadian market on the Gold prices.

4.14 Variance Decomposition Of D(LCAN)

The below mentioned table explains the results of variance decomposition in which we see contribution of every source of innovation in foreseeing each variables error variance is communicated. We used this to see that how much shock of Gold

Prices is explained by Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index. From the results of above table we can say that 94% of variation in Gold Market comes through the Canadian Islamic Equity Market, which means risk and returns of Canadian Islamic Equity Market affects the Gold Market most. From the results of above table we can also conclude that Canadian Islamic Equity Market is not as much efficient. There is just 5% variation come into Gold Market due to its own market.

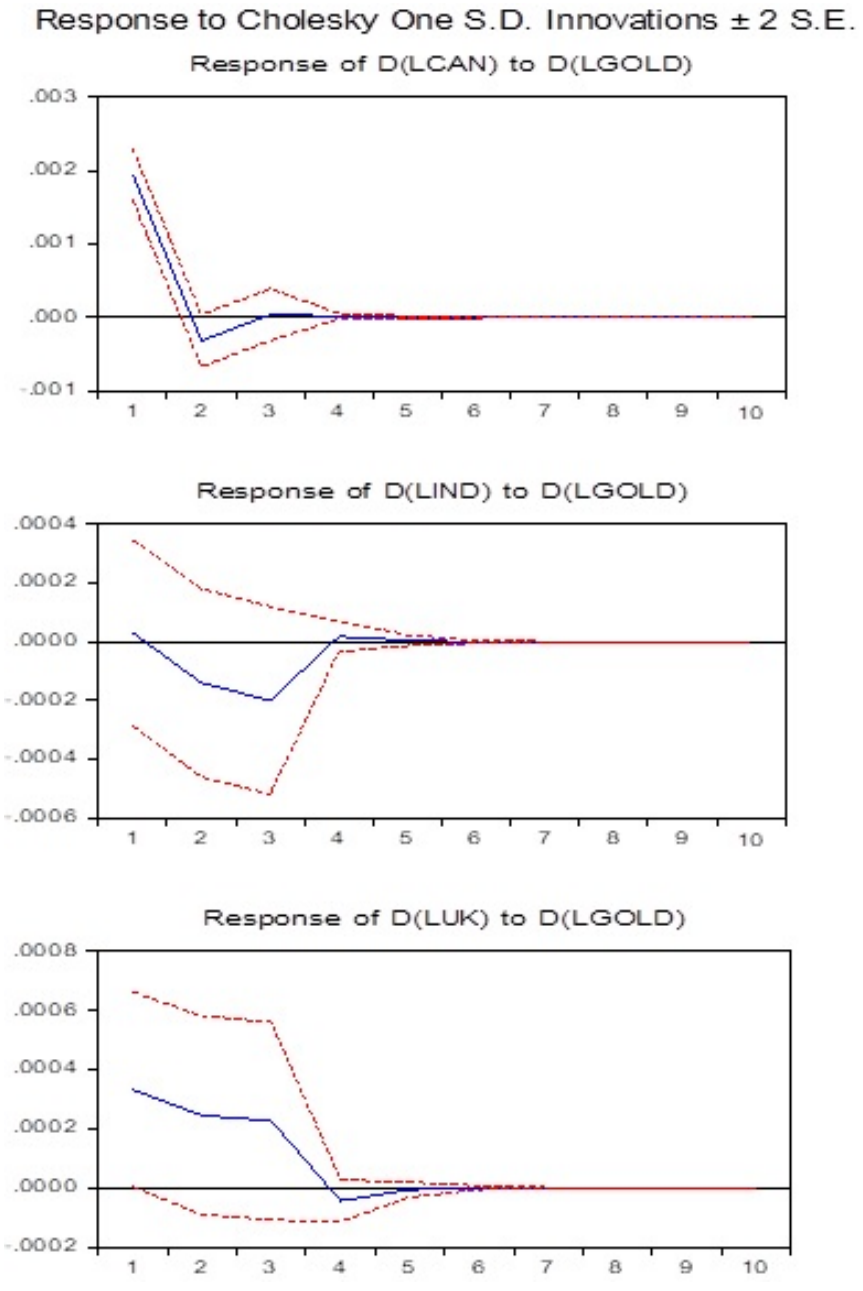
TABLE 4.12: Variance Decomposition Of D(LCAN)

Period	**S.E.**	**D(LGOLD)**	**D(LCAN)**	**D(LIND)**	**D(LUK)**
2	0.0078	5.2314	94.7417	0.013546	0.0132
3	0.0078	5.2186	94.6153	0.132154	0.0338
4	0.0078	5.2189	94.6145	0.132152	0.0342
5	0.0078	5.2189	94.6143	0.132287	0.0344
6	0.0078	5.2189	94.6143	0.132291	0.0344
7	0.0078	5.2189	94.6143	0.132291	0.0344
8	0.0078	5.2189	94.6143	0.132291	0.0344
9	0.0078	5.2189	94.6143	0.132291	0.0344
10	0.0078	5.2189	94.6143	0.132291	0.0344

4.15 Impulse Response

The below mentioned figure shows the responses of Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index on Gold Prices. Impulse response tells us the reaction of dependent variable over the time to a given innovation. As we can see in above graph we can see the response of Canadian Islamic Equity Market on Gold Market, there is small decrease in that graph it could be a recessionary period in Canadian Islamic Equity Market due to which this decrease came into these markets after this period the trend became smooth. The above figure shows the impulse response

of Gold market from a one standard deviation shock to Dow Jones Islamic Market India Index. We can see there is huge decline in these series that means in that period Gold Prices did not capture what is happening in Dow Jones Islamic Market India Index. If we see the response of Gold prices to Dow Jones Islamic Market U.K. we can see that the line is in band that means impulse response relation dies exist and it is not equal to zero that means this relation is significant, that means responses of Gold to Dow Jones Islamic Market U.K exist which means if Dow Jones Islamic Market U.K will create a shock then Gold Prices will response against this.



For 6 Years: LOIL = LCAN LIND LUK

4.16 Trace Test

Table 4.13: Trace Statistics

Hypotheses	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None	0.007347	42.38548	55.24578	0.4023
At most 1	0.004749	24.62027	35.01090	0.4063
At most 2	0.004364	13.15367	18.39771	0.2318
At most 3	0.001086	2.617084	3.841466	0.1057

Trace test indicates no co-integration at the 0.05 level.

The above table result values where not adequate to reject the Null Hypothesis which is that there is no co-integration exits between the series. So we cannot make any combination of series which are non-stationary. The results of Trace test shows there is no co-integration equation at the level of 0.05, therefore the result indicates that there is no co-integration in long term between Oil Prices and Islamic Shariah Equity indices.

4.17 Vector Auto-regression

Table 4.14: Vector Auto-regression

	D(LOIL)
D(LOIL(-1))	-0.1381
	(0.02382)
	[-5.79885]
D(LCAN(-1))	0.165966
	(0.05601)
	[2.96291]
C	-0.0003
	(0.00036)
	[-0.70961]

In the above table we see the vector Auto-regression between Oil Prices and Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index. Vector auto-regressive model tell the evolution of a set of dependent variables over the same period as a linear function of only on their lag values. Here we can see that Oil Prices has on lag impact on its own market as we have conformed from lag length criteria test that it impact exist in just 2 lags. Canadian Islamic Equity Market has impact on Oil Prices for just 1 lag.

4.18 Variance Decomposition

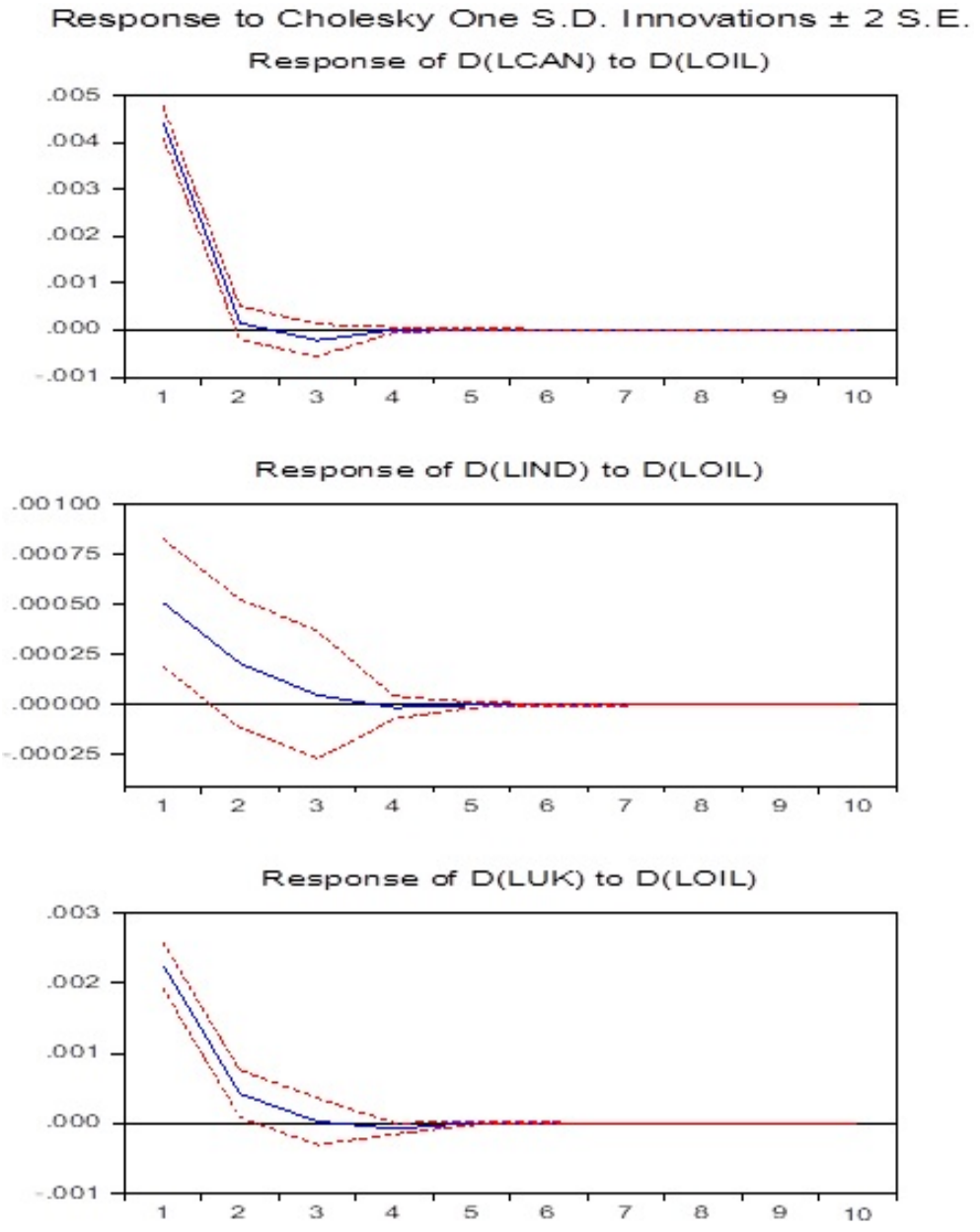
Table 4.15: Variance Decomposition Of D(LCAN)

Period	**S.E.**	**D(LOIL)**	**D(LCAN)**	**D(LIND)**	**D(LUK)**
2	0.0178	26.4723	73.4908	0.0110	0.0258
3	0.0178	26.4671	73.3676	0.1223	0.0428
4	0.0178	26.4667	73.3672	0.1224	0.0435
5	0.0178	26.4668	73.3668	0.1226	0.0435
6	0.0178	26.4668	73.3668	0.1226	0.0436
7	0.0178	26.4668	73.3668	0.1226	0.0436
8	0.0178	26.4668	73.3668	0.1226	0.0436
9	0.0178	26.4668	73.3668	0.1226	0.0436
10	0.0178	26.4668	73.3668	0.1226	0.04360

In above table we check the contribution of each source of innovation in seeing each variables error variance which is communicated by Variance Decomposition analysis. Here we see the variances of Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index on Oil Prices. The results of above table shows that there is 26% variance comes into the Oil Market by its own market and 73% variance come into the Oil Market due to the Canadian Islamic Equity Market. It means if something will be happen in Canadian Islamic Equity Market it will affect Oil Market because 73%

variance of Oil market depends upon the Canadian Islamic Equity Market. In the end we can conclude that risk and returns of Canadian Islamic Equity Market has significant impact on Oil market if the shock will create in Canadian Islamic Equity Market it will affect the Oil market.

4.19 Impluse Response



In the above figure we can see the response of Oil Prices on impulse of Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and

Dow Jones Islamic Market U.K. Index. In impulse response we see response of Dependent Variables to a given innovation over the specific period of time. In the 1st figure we can see the response of Oil prices to the Islamic Market Canada Index, in this graph we can see the line is within band and values are not equal to zero which means there relation is significant. If the shock will create in Islamic Market Canada Index response will be generate from Oil Market. In the 2nd graph we can response of Oil market on the impulse of Islamic Market India Index there value is not equal to zero which means there relation is significant and if something will be happen in Islamic Market of India it will affect Oil Market. Same as in the 3rd graph which also shows that there is significant relationship between Oil Market and Islamic Market of U.K and the line lies between the band, so if the shock will create into the Islamic Market U.K response will be generated from Oil Market.

4.20 Time Varying Conditional Correlation

4.20.1 Dynamic Conditional Correlation - DCC Model

Table 4.16: DCC-GARCH Models With Respect To Each Country

Sr. #	**Countries**	**Method**
6 Years		
1	Canada	GJR-GARCH
2	India	GJR-GARCH/E-GARCH
3	U.K.	GJR-GARCH/ E-GARCH
10 Years		
4	China	GJR-GARCH
5	Japan	GJR-GARCH/ E-GARCH
6	Kuwait	GJR-GARCH/ E-GARCH
7	Turkey	GJR-GARCH

This table shows the optimal uni-variate DCC GARCH model with respect to each country and we have selected which was appropriate. We have selected these models on the basis of the lower value of Akaike Information Criteria (AIC).

TABLE 4.17: DCC-GARCH Estimates With Respect To Each Country

	θ_1	θ_2
For 10 Years		
RGOLD-RCH	0.016611	0.933153
	(0.0164)	(0.0000)
RGOLD-RJAP	0.001045	0.795734
	(0.0000)	(0.0000)
RGOLD-KAW	-0.008078	0.043571
	(0.0004)	(0.0000)
RGOLD-TUR	0.023848	0.834317
	(0.0219)	(0.0000)
ROIL-RCH	0.014017	0.955553
	(0.0111)	(0.0000)
ROIL-RJAP	0.005444	0.908808
	(0.4034)	(0.0000)
ROIL-RKAW	-0.005111	0.966149
	(0.2324)	(0.0000)
ROIL-RTUR	0.013125	1.018112
	(0.0110)	(0.0000)
For 6 Years		
RGOLD-RCAN	0.029017	0.921878
	(0.0000)	(0.0000)
RGOLD-RIND	0.045007	0.583227
	(0.0286)	(0.0001)
RGOLD-RUK	0.036228	0.908741
	(0.0000)	(0.0000)
ROIL-RCAN	0.007136	0.989673
	(0.0004)	(0.0000)
ROIL-RIND	0.000142	0.785021
	N/A	N/A
ROIL-RUK	0.026616	0.887187
	(0.0175)	(0.0000)

This above table concludes the values of coefficients which are estimated from DCC-GARCH in a bi-variate framework for Oil, Gold and Islamic Equity Markets. Values in parenthesis are the p-values of Theta(1) and Theta(2). For the selection of a suitable uni-variate GARCH model we use Akaike Information Criteria (AIC).

In the above table we see two main things (θ_1) and (θ_2) with their p-values, (θ_1) tells about the impact of past residual shocks on correlation and (θ_2) lagged dynamic conditional correlation. Before interpreting these values 1st we will check the stability condition of DCC Model. To check the stability condition we will add (θ_1) and (θ_2) if there sum will be greater than 1 then we can say that these all series met the stability condition. In above table all countries successfully met the stability requirements id DCC model. N/A shows that above couple do not met the stability criteria of DCC model. This means that dynamic conditional correlation does not exist between them. If we see the results of 10 years data we can see that θ_1 p-values of S&P Japan 500 Shariah Index, S&P Kuwait Shariah index, Dow Jones Islamic Market Turkey Index, and Dow Jones Islamic Market China Index are significant which means all these countries have impact of past residual lags on Gold market except than Kuwait Shariah index it has negative past residual lag impact. θ_2 vales are positive and significant which means there exist and lagged dynamic conditional correlation between Gold Market and S&P Japan 500 Shariah Index, S&P Kuwait Shariah index, Dow Jones Islamic Market Turkey Index, and Dow Jones Islamic Market China Index. In the data range of 6 years we can also see same situation like Gold market, from above table result we can say that there exist impact of past residual shocks on correlation (θ_1) and lagged dynamic conditional correlation (θ_2). In the data range of 6 years we can see that there exist impact of past residual shocks on correlation (θ_1) and lagged dynamic conditional correlation (2) between Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index, Oil Markets and Gold Markets.

4.20.2 Asymmetric Dynamic Conditional Correlation - ADCC Model

Table 4.18 represents the results of ADCC-GARCH model between Oil Prices, Gold Prices, and Islamic equity indices. The suitable model is selected in the basis of lowest AIC.

TABLE 4.18: ADCC-GARCH Models With Respect To Each Country

Sr. #	**Countries**	**Method**
6 Years		
1	Canada	GJR-GARCH
2	India	GJR-GARCH
3	U.K.	GJR-GARCH
10 Years		
4	China	GJR-GARCH
5	Japan	GJR-GARCH/ N/A
6	Kuwait	GJR-GARCH
7	Turkey	GJR-GARCH

In the below mentioned table Theta (1), Theta (2) and Theta (3) are used as basic parameters. Where 1 tells us about the impact of the past residual shocks, 2 tells us about lagged dynamic conditional correlation and 3 tells us about the information about the shocks of positive and negative news on dynamic conditional correlation. In this model stability of model has been checked through the sum of 1 and 2 if the sum will be greater than 1 then this model will be noted as a stable otherwise it will not get entertained. N/A shows that above couple do not met the stability criteria of DCC model. This means that dynamic conditional correlation does not exist between them. Result of above table shows that there is no impact asymmetric news on Islamic countries except than Turkey Islamic Market.

TABLE 4.19: ADCC-GARCH Estimates With Respect To Each Country

	θ_1	θ_2	θ_3
For 6 Years			
RGOLD-RCAN	0.0306	0.9182	-0.0031
	(0.0004)	(0.0000)	(0.7396)
RGOLD-RIND	0.0516	0.5720	-0.0352
	(0.0259)	(0.0001)	(0.4775)
RGOLD-RUK	0.0441	0.8963	-0.0163
	(0.0000)	(0.0000)	(0.2316)
ROIL-RCAN	0.0064	0.9899	0.0008
	(0.0025)	(0.0000)	(0.4658)
ROIL -RIND	-0.0137	-0.0379	0.0166
	N/A	N/A	N/A
ROIL -RUK	0.0261	0.8857	0.0010
	(0.0256)	(0.0000)	(0.9100)
For 10 Years			
RGOLD-RCH	0.0138	0.9422	0.0046
	(0.0735)	(0.0000)	(0.4682)
RGOLD-RJAP	0.0187	0.2250	-0.0221
	(0.3432)	(0.5639)	(0.4009)
RGOLD-RKAW	0.0042	0.9221	-0.0098
	(0.5643)	(0.0000)	(0.4696)
RGOLD-RTUR	0.0431	0.7405	-0.0385
	(0.0024)	(0.0000)	(0.1025)
ROIL-RCH	0.0099	0.9510	0.0079
	(0.0503)	(0.0000)	(0.1844)
ROIL-RTUR	0.0243	1.0019	0.0036
	(0.0000)	(0.0000)	(0.0000)
ROIL-RKAW	0.0028	1.0006	-0.0119
	N/A	N/A	N/A

This table shows the optimal uni-variate DCC GARCH model with respect to each country and we have selected which was appropriate. We have selected these models on the basis of the lower value of Akaike Information Criteria (AIC).

Chapter 5

Conclusion & Recommendations

5.1 Conclusion

This study emphasis on two main objectives, the first objective of this study is to see the co-movement between oil Prices, Gold Prices and Islamic Shariah Indices (Islamic Market India Index, Islamic Market Canada Index, Islamic Market U.K. Index, Islamic Market of Japan Index, S&P Kuwait Shariah index, Islamic Market Sri Lanka Index, Islamic Market Turkey Index, Islamic Market China Index) and the second objective of this study to examine the time varying volatilities between the Islamic Shariah indices, Gold prices and Oil prices by using DCC GARCH between the time frame of 10/2009 to 11/2019.

First of all the stationary of data has been checked by using ADF test on level and 1st difference. The result of ADF test was that all of the series of Gold prices, oil prices and Islamic equity indices are stationary at first difference means all the series are integrated to order one I(1). To verify the results of ADF test another technique has been used which named as Phillips-Perron test, the results of Phillips-Perron test are also support the results of ADF. So from both ADF test and Phillips-Perron test our series are integrated to order one I (1). After getting the results from both tests that these series are stationary to order one so to examine the co-integration between the set of non-stationary time series of Gold prices, Oil prices and the Islamic equity indices Johansen-Juselius (1990) approach

has been used. For some countries like Islamic Market India, Islamic Market Canada, Islamic Market U.K. the data is available from six years to 10/2013 to 11/2019. And for other countries like Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, Islamic Market China 10 years data has been used from 10/2009 to 11/2019. Johansen-Juselius approach has been applied separately on both time series of 6 years and 10 years. The results of Johansen-Juselius show that there is no co-integration between these series. First of all co-integration has been checked between the series of Gold and Islamic Equities like Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China. There was no co-integration between theses series which means there is no long term relationship exists between these series. Then vector Auto-regressive model has been applied on this series the result of vector Auto-regressive shows that there exist lag impact of Gold on its own market, and there also exist lag impact of Islamic Market of China on the Gold Market. Islamic Market of Sri Lanka has also one lag impact on Gold market.

After applying the vector Auto-regressive, variance decomposition and impulse response also has been applied on the series of Gold Prices and Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China. The results of Variance Decomposition shows that variation in Gold Market is exist not because of its own market it does exist because of other markets. There exist 80% variation in Gold Market due to the Islamic Market of Japan and almost 20% variation comes through Islamic Market of China, so the risk and returns of Islamic Market of Japan and through Islamic Market of China will affect the Gold Market. The results of Impulse response indicates that if any variation will come into the Islamic Equity indices of these countries it will affect the Gold Market because the line of impulse response lies between the band and there value does not equal to zero which means there relationship is significant if impulse will create in one market other market will response against that market.

On the other side co-integration has been also checked between the second series

of Oil and Islamic Equities like Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China within a time frame of 10 years. Johansen-Juselius Co-integration test has been applied on theses series results of these series indicates that there does not exist co-integration between series of Oil and Islamic Equities like Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China. The null hypothesis did not reject which was that there is no co-integration between these series. So there is not any co-integrating equation exist between these series. Then vector Auto-regressive test has been used to determine whether lag impact exist between Oil market and Islamic Equity indices. Results of vector Auto-regressive indicate that there exists one lag impact of Oil prices on its own market.

Variance Decomposition and Impulse response has been also use to examine which market has more variation and which market is cause in creating variation in Oil market, and impulse response is used to see which market create impulse and does Oil market response against that or not. Variance decomposition shows the results of 10 periods variation of Oil Market and Islamic Equities like Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China. The results indicate that there exist 78% variation in Oil Market due to the Islamic Market of Japan and 17% variation in Oil Market due to Islamic Market of China and there is just 2% variation rises in Oil market because of its own market. As Gold Market and Oil Market are two commodities of commodities market and these both are very important commodities so the effect of every Islamic Equity indices will be same on it.

Results of Impulse response shows that all values are within band and there value is not equal to zero which means these are significant. If the innovation will come into the Islamic Market of Japan, S&P Kuwait Shariah, Islamic Market Sri Lanka, Islamic Market Turkey, and Islamic Market China response will generate in Oil Market. Co-integration approach has been also applied on time period of six years. There was two series; first series were of Gold Prices and Islamic Equity indices like Islamic Market India, Islamic Market Canada, and Islamic Market

U.K. and the second series were oil Prices and Islamic Equity indices like Islamic Market India, Islamic Market Canada, and Islamic Market U.K. Johansen-Juselius Co-integration approach has been applied on first series of Gold Prices and Islamic Equity indices like Islamic Market India, Islamic Market Canada, and Islamic Market U.K., the results of Johansen-Juselius Co-integration approach indicates that there do not exist co-integration between these series of Gold Prices and Islamic Equity Market, which means that there series are fails to reject to null hypotheses which was that there is no co-integration between these series. To see the relationship between these series vector Auto-regression, variance Decomposition and impulse response has been applied.

In Vector Auto-regression lag relation between the Gold prices and the Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index has been examined. The results of vector Auto-regression shows that there exists one lag impact of Gold Prices on its own market and there also exist one lag impact of Islamic Market of Canada on Gold Market. Results of Variance decomposition shows that there is 96% variation comes into the Gold Market due to the Islamic market of Canada, which means the Islamic market of Canada is not as much effective the risk and returns of Islamic market of Canada will affect the Gold Market and there is just 5% variation comes into the gold market due to its own market.

Impulse response test has been applied on the series of Gold prices and the Dow Jones Islamic Market India Index, Dow Jones Islamic Market Canada Index, and Dow Jones Islamic Market U.K. Index to see that how impulse of one market is respond by other market. The lines of Impulse response are within a band and they are significant. Which means the impulse of one market will be respond by other markets. There was a decrease in Islamic Market of India because of any economic issue but later on its gone smooth. On the other side co-integration between Oil Prices and Islamic Equity indices like Islamic Market India, Islamic Market Canada, and Islamic Market U.K. has been checked within a data range of six years of 10/2013 to 11/2019. Johansen-Juselius Co-integration approach has been applied to examine the co-integration between Oil Prices and Islamic Equity

indices like Islamic Market India, Islamic Market Canada, and Islamic Market U.K.

The results of co-integration say that there is no co-integration exists between these series. Trace test has been used to see where the co-integration exists between these series or not. Null Hypothesis of Trace test was not rejected. So there is no any co-integrating equation exist between these series. Vector Auto-regressive test, Variance Decomposition test and Impulse response has been used to examine the relationship between these series. The results of Vector Auto-regressive test shows the lag impact of Oil Prices and Islamic Equity indices like Islamic Market India, Islamic Market Canada, and Islamic Market U.K. There exists one lag impact of Oil market on its own market. And there also exist one lag impact of Islamic Market of Canada on Oil Market because the t-value is greater than 1.96 which means that this impact significant and it does exist.

The result of impulse response shows the impulse response of Oil Prices and Islamic Equity indices like Islamic Market India, Islamic Market Canada, and Islamic Market U.K. there exist response of Oil Market with Islamic Market India, Islamic Market Canada, and Islamic Market U.K. because the lines are within band the relationship among these series is significant so the change in one market will affect the other market. The results of Variance decomposition show that variation in Oil Market due to Islamic Market India, Islamic Market Canada, and Islamic Market U.K. there is 73% variation comes into the oil market because of Islamic Market of Canada and 26% variations comes into the Oil market due to its own market. So the conclusion of above discussion is that Gold Market and Oil market are two commodities of Commodity market and these are used as a input in every country, Oil is mostly used as inputs in industries and Gold is used to hedge or for the investment purpose. So these markets do not have their own values, there rise and fall depends upon the other industries and on the countries. Above results supports this thing because the results of Variance decomposition and impulse response shows that the huge percentage of variance in these markets are depends upon the other markets. And the impulse response shows that if impulse is create in some other markets Gold and Oil markets respond against these impulse.

In conclusion there is no co-integration between the Oil Prices, Gold Prices and Islamic Equity Indices. This means that there is no correlation between these series, if one thing will happen in one market other will be not get affect. So that investor can invest in Commodity market and in Islamic Equity Market then he will be able to get benefit of diversification. The results of this study are in line with theory of Markowitz (portfolio diversification) which suggests to invest in different nature of securities. The second objective of this study to examine the time varying volatilities between the Islamic Shariah indices, Gold prices and Oil prices by using DCC GARCH between the time frame of 10/2009 to 11/2019. To examine the time varying correlation Uni-variate DCC GARCH model with respect to each country was used. We have selected these models on the basis of the lower value of Akaike Information Criteria (AIC). For this purpose two main things (1) and (2) with their p-values has been used, whereas (1) tells us about the impact of past residual shocks on correlation and (2) lagged dynamic conditional correlation. From the DCC-GARCH the results of (1) has been concluded that their exist impact of past residual shocks on correlation between the Oil Prices, Gold Prices and Islamic Market India Index, Islamic Market Canada Index, Islamic Market U.K. Index, S&P Kuwait Shariah index, Islamic Market Sri Lanka Index, Islamic Market Turkey Index, Islamic Market China Index except than Islamic Market of Japan Index. The results of (2) concludes that there exist dynamic conditional correlation between Oil Prices, Gold Prices and Islamic Market India Index, Islamic Market Canada Index, Islamic Market U.K. Index, S&P Kuwait Shariah index, Islamic Market Sri Lanka Index, Islamic Market Turkey Index, Islamic Market China Index, Islamic Market of Japan Index.

5.2 Recommendations

The findings from the current study provide clear and explicit recommendation to all individuals connected to market, whether they are policy maker, investors and portfolio managers. They should keenly observe the information and changes

occurring in variety of industries, especially occurring in global market. Few significant recommendations arising from this study are:

- In the current era it is been observed that Oil Prices and Gold Prices are experiencing fluctuation, and Islamic Equities are on its boom, so it is a good opportunity for the investors to invest in it.
- These commodities are showing time-varying conditional correlation which indicates the dynamic nature of correlation present among commodities. Moreover, the asymmetric behaviour among commodities is also present.
- Gold, Oil and Islamic equity indices are not moving in the same directions so investors can have safe investment opportunities.

5.3 Future Direction & Limitations

Although this study gives a comprehensive understanding on the area of co-movement and time varying correlation of commodity market as well as Islamic equity market, but obviously it does not covers all the aspects the these markets. This study was just limited to those countries which ones data is easily accessible. The data of MENA countries was not accessible.In future this study can be further explored by adding more data from different time streams in this study, as the data used for this study is time series data that quickly out dates. In future indices of more Islamic Countries can be added for the better understanding of market behaviour. In addition to this study more models from the GARCH family can be added. To further explore this study data of MENA countries can be added.

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