VOLATILITY TRANSMISSION FROM OIL MARKET TO INDUSTRY RETURNS. AN EVIDENCE FROM DCC & ADCC GARCH MODEL

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CERTIFICATE

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Author's Declaration

I, Muhammad Inam Ullah, hereby state that my MS thesis titled "Volatility Transmission from Oil Market to Industry Returns. An Evidence from DCC & ADCC GARCH Model" is my own work and has not been submitted previously by me for taking any degree from Pakistan Institute of Development Economics or anywhere else in the country/world.

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Dedication

I am dedicating this research work to all my family members, especially my beloved brother, Mr. Muhammad Aman Ullah who helped me in every possible way for my successful future. Without his help, patience and confidence in me, I was not able to complete this whole journey.

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ABSTRACT

The aim of this analysis is to scrutinize the gains and variability surplus amongst global oil rates as well as the gains of 11 industries on the Pakistan Stock Exchange on a regular basis from July 1st, 2000 to June 30th, 2019. The approach of this investigation was carried out in three steps: The first component is ARMA GARCH, which measures the average and variability surplus rates from oil sector to various industrial gains.; ARMA-TGARCH and ARMA –EGARCH models are the second part to capture the asymmetric effect of information while dynamic tentative correlation (DCC) and the asymmetric dynamic tentative correlation (ADDC) approaches are the third part to measure dynamic correlation amongst oil rates and industrial gains. The conclusion of the estimates reveals that there are no average surplus consequences of oil market volatility on cement, Power, fertilizer, automobile, sugar, textile, tobacco and oil and gas sectors. The average equations are also exhibiting that there are negative and momentous average surplus consequences of oil market volatility on the refinery and chemical sectors. Lastly, the average equation illustrates that there is positive and momentous average surplus consequences of oil market volatility on paper sector. Also, it is realized that there are no variability surplus consequences from oil market volatility to chemical and energy sectors, positive variability surplus consequences from oil market volatility to fertilizer sector, negative variability surplus effect from oil market volatility to automobile, paper and refinery sectors but no ARCH consequences existed in case of oil and gas sectors. Ultimately, it is found that nowadays' instabilities of different sectors profit such as automobile, energy, paper, refinery, fertilizer, chemical, tobacco and oil value gains are responsive to their own respective preceding volatilities.

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LIST OF ABBREVIATIONS

ADCC	Asymmetric Dynamic Conditional Correlations
ARCH	Autoregressive Tentative Heteroscedasticity
AUD	Australian Dollar
DCC	Dynamic Conditional Correlations
EGARCH	Exponential Generalized Autoregressive Tentative Heteroscedasticity
EMH	Efficient Marketplace Hypothesis
EUR	Euro
GARCH	Generalized Autoregressive Tentative Heteroscedasticity
GBP	British Pound Sterling
JPY	Japanese Yen
PSX	Pakistan Stock Exchange
TGARCH	Threshold Generalized Autoregressive Tentative Heteroscedasticity
VAR	Vector Autoregressive

CHAPTER 1

INTRODUCTION

The increase in financial globalization has connected the marketplaces of different countries through financial, economic interpretation and transmittal of variability from the commodity marketplace to the capital marketplace has gained the interest of the financial community throughout the world (Adeitan, 2019). The strong interdependence of world marketplaces both financial and commodity marketplaces has made the situation more vulnerable for the investors while making their investment choices. The investors and policymakers would have to adjust their portfolios to protect themselves from uninvited disturbance and crises (Adeitan, 2019). Any disorder in one marketplace transmits signals to other marketplaces that affect the profit of the financial marketplaces (Wilks, 2020). The investors in countries lose their confidence in the financial marketplace when sudden changes cannot be explained by fundamental economic factors (Wilks, 2020). It is, therefore, important to measure the factors that are transmitted and cause variability in the marketplace.

Financialization of oil marketplaces and increase oil trading across the globe boost the transmittal of oil value fluctuations to financial marketplaces of the economy (Wilks, 2020).There is a evident and empirical literature on oil and its variability surplus effect on financial marketplaces (Wilks, 2020). The historical transmittal of information amongst marketplaces is measured by average and profit volatility. The issue of average and profit variability surplus in the context of different capital vs. commodity marketplaces has been scrutinized by many practitioners across the globe (Wilks, 2020).

These fluctuations have seen to have a strong surplus effect on financial marketplaces during the global financial crisis of 2008 (Alam, Wei, & Wahid, 2020). The consequences of oil disturbance and its surplus consequences are stronger in developing countries because crude oil affects their state of the economy (Alam et al., 2020). When the oil rates rise, the expense of yield and transportation increases which disrupts the state of the economy (Masood, Tvaronavičienė, & Javaria, 2019). One of the major sectors that consequences the state of the economy is the stock marketplace of a country. The stock marketplace of a country plays a major role in the development of an economy as it provides an investment platform for local and foreign investors (Masood et al., 2019).

The investors always seek to minimize their venture and maximize their profit since their profit is responsive to the changes in oil value so, the effect of changes in oil rates alongside its effect on stock profit has become a matter of concern for them (Ding, Cui, Zheng, & Du, 2021). Changes in oil rates affect the stock profit by a channel of expected capital. Oil is one of the important components in the yield of goods and services as the oil rates rise the expense of yield rises which in turn reduce the margins, capitals, and stock profit (Ding et al., 2021). On the other hand, the increase in oil value creates inflationary situations that compel the policymakers to tighten their monetary policy and raise their interest rates (Ding et al., 2021).

The fluctuations in oil rates directly affect the income and capital of different industries which in turn affects the stock rates (Shabbir, Kousar, & Batool, 2020). The fluctuation in oil rates is an important issue for developing countries like Pakistan. Most of the oil produced in the country is not enough to fulfill the consumption of the whole economy; there is a huge gap amongst consumption and yield of oil in Pakistan. Keeping in view of fluctuations in oil rates and its surplus consequences (Shabbir et al., 2020). It is important to check its effect on Pakistani sectorial profit. Pakistan is a developing nation and its two-third of the economy is based upon four major sectors that are oil, chemical, textile, food, and agriculture[1]. All of these sectors are affected directly or indirectly by the changes in the rates of oil. So it is important to conduct an investigation that will measure the transmittal of variability from the oil marketplace to the specific industry of Pakistan. This investigation aims to scrutinize the variability transmittal from the oil marketplace to the specific industrial profit of companies listed in the Pakistan stock exchange (PSX).

1.1 Theoretical Background

1.1.1 Efficient Marketplace Hypothesis (EMH)

The Efficient Marketplace Hypothesis (EMH) was conferred by Eugene Fama (1970) basically states that at some random time, stock expenses mirror all accessible data,

[1] http://finance.gov.pk/survey/chapters_19/Economic_Survey_2018_19

for example, all known data about venture protections, like stocks, is as of now figured into the expenses of those protections. Along these lines, it is difficult to reliably pick stocks that will beat the profits of the general financial exchange.

Powerless edifice, semi-stable edifice, and solid edifice EMH are the three types of productive business speculation. With erratic walk speculation, powerless edifice EMH is reliable, i.e., stock expenses pass randomly and value shifts are in depend upon one another. It expresses that protection expenses represent all marketplace data in terms of quality, i.e., genuine value information. As a result, it is unrealistic to presume to output the industry by acquiring unusual gains on the basis of advanced (pattern) investigation (where inspectors precisely anticipate future value changes through the diagram of past value developments of stocks). According to semi-solid scheme EMH, rates fluctuated rapidly in response to demand and public details, such as benefit and acquisition; announcements and political or monetary events. As a result, expecting unusual gains from the premises of primary inquiry is beyond the realm of possibility. According to the solid scheme EMH, expenses red notes business, public, and private data, i.e., no financial supporter has monopolistic access to data. Productive marketplace theory is founded on three assumptions. The first is that financial supporters are rational and value protections based on highest expected utility. Second, if financial backers are not reasonable, their trades are considered to be arbitrary, cancelling out any expense effect. Third, rational arbitragers are forced to disregard the consequences that illogical financial supporters have on marketplace/security rates.

1.2 Problem Statement

The variability in stock profit due to fluctuation in global oil rates has been increased due to financial liberalization and globalization. Due to an increase in population and with the growing economy the consumption of oil has increased in Pakistan during the past few decades. The variability in the value of oil influences the economy as a whole because it depreciates the domestic currency versus the foreign currency. Pakistan is an oil-importing country most of its agricultural and industrial sectors depend upon oil. The increase in oil value has compelled the companies to increase their selling expense ands the depreciation of domestic currency leads towards the inflationary situation. The changes in monetary policy in one country overflow to the other parts of the world. The increase in inflation has made the investors less interested to invest in our country. The change in monetary policy directly affects the financial marketplaces of the country. The overview of the financial marketplace indicates that there has been a lot of ups and downs in oil rates during the last few decades. In the last two decades, oil disturbance have been observed. This investigation scrutinizes the relationship amongst changes in oil rates and the transfer of its disturbance to the Pakistani stock market.

1.3 Research Gap

The transmittal of the surplus effect of oil to different financial marketplaces has been observed in developed and emerging economies. The conclusion of one country cannot be generalized to another country because of the contextual differences. Although measuring surplus effect is an important concern for the investors but there is little prior work that has been done in the context of Pakistan. Malik and Rasheed (2017) have measured the unexpected disturbance in world oil rates and their effect on gains of PSX. The investigation has used VAR-GARCH and provided several reasons for using the VAR-GARCH technique as it considered to be a less expensive to estimate and appropriate technique. It allows multivariate analysis alongside a tentative cross-sectional effect. The analyses argue that the VAR-GARCH model is highly sensitive to the era of forecasting. Nwogugu, (2006) argues that the VAR-GARCH model assumes that the variability is constant over the forecasting era, over the segments of investment horizon, and any replacement is replaced by fixed volatilities from fixed distribution. The VAR-GARCH model also overstates the degree of persistence in profit volatility. For measuring the effect of oil disturbance on PSX. The current investigation will use a dynamic tentative correlation of the (DCC) GARCH model. The model of DCC-GARCH is better than VAR-GARCH because it constructs the assumption of time-changing correlations. The model of DCC-GARCH also has the parametric advantage of using a correlation mechanism that is independent of the number of series to be correlated, giving it greater precision than other GARCH models. This research employs Engle's (2002) by DCC-GARCH model to evaluate the presence of contamination during the financial crisis of 2008. The position of possible improvements in restrictive partnerships for some time is the advantage of using especially this model. As a result, we can detect complex investor activity in relation to news and developments.

1.4 Research Questions

This research will scrutinize the following questions:

- Does variability surplus exist amongst oil marketplace and different industries of PSX?
- Whether variability surplus is better captured by using the asymmetric model?
- Whether time-varying correlation exists amongst the oil marketplace and different industrial profit?
- How the models based on asymmetric information can capture variability surplus?

1.5 Research Target

This research will have the following target:

- To inspect the variability surplus from the oil marketplace to the industry profit of Pakistan.
- To inspect the time-varying corrections of the oil marketplace to the industrial profit of PSX.
- To inspect the possibilities of asymmetric behavior of correlation amongst the oil marketplace and industry profit of Pakistan marketplace.

1.6 Significance of the Investigation

Pakistan is an oil-importing country. Most of the industries and trading companies such as textile, chemical, food, and agriculture depend upon oil. The changes in the value of oil lead to inflation which reduces the buying power of people. This halts their survival for their basic needs. Falling oil rates are a blessing for the developing nation. The falling oil value creates an opportunity set for investors to hedge their portfolios. Some industry transmits oil rates to the end-user. So, the influence of oil value and its influence on the stock marketplace has become an important issue during the past decade. This investigation will be helpful for investors, policymakers on how changes in oil rates information into industry profit of PSX. It provides insight into how fluctuation in oil rates affect the industry gains and how managers can diversify their portfolio to invest in uncorrelated and independent industry.

1.7 Organization of Investigation

The sequence of this investigation is systematized as shown below. Chapter 2 provides a detailed analysis of the average variability surplus. Chapter 3 contains the discussion of variables development, data, and sample; econometric model as well as the methodology of the investigation . Chapter 4 comprises of empirical analysis and discussion. While chapter (5) contains the conclusion, policy recommendations, limitations and direction for the future research of the investigation.

CHAPTER 2

LITERATURE ANALYSIS

This chapter offers a comprehensive summary of preceding empirical studies that are conducted to explore the average and variability surplus. Most preceding empirical studies of profit- variability behavior conduct are in the context of the emphasis has shifted from the mature stock marketplace to the emerging and developing stock marketplaces in current days.

Variability surplus is the financial disturbance from one marketplace to another or transmittal of information among the marketplace and such disturbance have been analyzed in a different regions of Europe, Asia, and America. Different empirical studies also suppose that variability is based on the correlation of profit and if gains are highly correlated, it means average surplus exists and vice versa.

After the 1987 crisis initially King and Wadhwani (1990) inspectd why in October 1987, nearly all stock marketplaces listed at world marketplaces fell despite differing economic circumstances. The investigation has inspectd rational expectation rates equilibrium contagion model amongst marketplaces as the result of logical try to utilize incorrect information about all the events that is related to the evenhandedness marketplace. They have performed different checks and tools to contaminate the model using the high-frequency data on or after the UK, USA and Japanese stock marketplace for eight months started from July 1987 to February 1988. The conclusion of the investigation indicated that an increase in variability leads to the high size of the contamination effect and it is due to the correlation amongst different marketplaces. Furthur Susmel and Engle (1994) support the findings of King and Wadhwani (1990).

Susmel and Engle (1994) argue that big disturbance in one marketplace leads to an increase in the other marketplace divergence and conclusion are resemble the 'contagion' effect in King and Wadhwani (1990). Susmel and Engle (1994) explain the timing of average and variability surplus amongst New York and London equity marketplaces. The investigation has inspected the consequences of news from the US stock marketplace to the UK marketplace; and from the UK marketplace to the USA marketplace for the era January 2, 1987, and February 29, 1989. The investigation has implied the GARCH model that provides evidence about the variability surplus, which lasts for a shorter period of time like an hour or so. Liu and Pan (1997) also support the findings of King and Wadhwani (1990); and Susmel and Engle (1994).

Liu and Pan (1997) explore average and variability surplus consequences from the U.S. and Japanese marketplaces to four Asian embryonic stock marketplaces, inclusive of Hong Kong, Singapore, Taiwan, and Thailand. The empirical findings are based on the data from 1984 to 1991 by using GARCH Model. The result of the investigation suggests that the U.S. marketplace is more influential than the Japanese marketplace in transmitting average and instabilities surplus to the four Asian marketplaces. Also, the findings suggest that surplus consequences are unsteady over time and their surplus have increased substantially after the October 1987 stock marketplace crash. Moreover, the evidence indicates that while the cross–country stock investing hypothesis, cannot by itself, explain the international transmissions of profit and instability, the marketplace contagion also plays an important role in the variability transmittal mechanism.

Additionally, Kanas (1998) analyzes the issue of unpredictability overflows across the three biggest European financial exchanges, in particular FTSE. The investigation has utilized the Exponential Generalized Autoregressive Tentative Heteroscedasticity (EGARCH) model to catch likely uneven influences of developments on unpredictability for the time of January 1984 to December 1993. The bidirectional overflows have been accounted for London to Paris and from Paris to Frankfurt. Similarly, a unidirectional overflow was noticed from London to Frankfurt. The finding of the examination in all cases demonstrates that these overflows are topsy-turvy, great and terrible news on the lookout. The outcomes exhibit that terrible news greatly affect the unpredictability of the marketplace than uplifting news. At that point the examination has isolated the example into pre and post-crash that is January 1, 1984, to September 15, 1987, and November 15, 1987, to December 7, 1993, individually. The pre and post-emergency recommend that overflows with higher power exist in the post-emergency. These discoveries propose that these business sectors turned out to be more associated after the accident.

Similarly, Buguk, Hudson, and Hanson (2003) scrutinize in their studies about the transmittal of variability within a vertical supply chain, which has received little attention in the literature. The main target of this investigation is to inspect the extent to which variability in primary input. The investigation has used the EGARCH model to check univariate variability surplus for rates in the supply chain. The findings reveal a potential need to manage the consequences of value variability throughout the supply chain and suggests that marketplace edifice may have an influence on the asymmetric transmittal of volatility.

The investigation of Yang and Doong (2004) scrutinizes the idea of the average and unpredictability transmittal instrument among stock and unfamiliar trade marketplaces of the G-7 nations. The discoveries support the awry unpredictability overflow influence and exhibit that developments of stock expenses will influence future conversion standard developments, however changes in profit rates directly affect future changes in stock expenses. The information check comprises of week by week shutting trade rates and financial exchange records for the G-7 nations for the time of May 1, 1979, to January 1, 1999. The investigation has utilized the observational procedure of multivariate augmentation of the EGARCH model, which is equipped for catching expected imbalances in the unpredictability transmittal instrument. The observational discoveries propose that there is data stream (transmission) amongst the two business sectors and that the two business sectors are incorporated.

Moreover, Singh, Kumar, and Pandey (2010) scrutinize in their studies about the value and uncertainty surplus amongst Asian countries like (Singapore, Japan, Hong Kong, Taiwan, Korea, India, Malaysia, Pakistan, China, Singapore, and Indonesia), European (United Kingdom, France, and Germany), and North American countries like (United States and Canada) marketplaces. The research looked at 15 countries, including major marketplaces in Asia, Europe and North America. Opening and closing rates were inspected from January 1st, 2000 to February 22nd, 2008. The average surplus is modelled using VAR, which takes into account fifteen global indices that are indicative of their respective capital marketplaces. According to the conclusion of the report, knowledge shifted from one industry to another industry as they operated or not. Furthermore, the industry that starts prior to the new marketplace has a momentous effect on it. By including the same day effect, the importance of trading time in average and variability surplus from marketplaces is demonstrated. Their findings support both average and variability surplus.

Furthermore, Rajhans and Jain (2015) scrutinized the uncertainty surplus of the currency marketplace by comparing the Canadian dollar, Pound, Australian dollar, Euro and Japanese yen (GBP, EUR, CAD, AUD and JPY) versus the US dollar from June 2008 to December 2012. The findings exhibit that the uncertainty in the USD/CAD exchange marketplace is not due to external disturbance, but rather to a reliance on internal variables.

Khalfaoui, Boutahar, and Boubaker (2015) analyze the surplus from the crude oil marketplace (WTI) to the financial marketplaces of the G-7 nations. Using multivariate GARCH models and wavelet analysis, the research scrutinized the average and uncertainty surplus of the oil marketplace to the stock marketplace values of the countries. The analytical findings exhibit signs of variability surplus from oil to the G-7, alongside time-varying associations amongst stock rates for different marketplace pairs.

Moreover, Choudhry and Jayasekera (2014) scrutinize the variability surplus consequences of the developed marketplace (US, UK, and the Germany) and worried about European Union marketplaces, (Portugal, Ireland, , Spain, Italy and Greece) from the era of 2002 to 2014. The investigation has also inspected the influence of the global crisis of 2007. The conclusion indicate both averages and variability surplus amongst the developed economies and the stressed European marketplace for the era 2007-2014. During pre-crisis era, there is indication of surplus from the Germany, the United Kingdom and United States to the economies of the EU, but there is little or no evidence of surplus from the low economies to the developed marketplace. The conclusion exhibit that during the crisis time, profit and uncertainty transfer processes amongst the major economies and the European economy are unsteady .

As regard to variability transmittal amongst oil rates and stock marketplace Malik and Rasheed (2017) has scrutinized the profit and variability surplus from world oil rates to eight sectors stock rates in Pakistan, by employs weekly data from 2001 to 2015 and VAR-GARCH model is used for data analysis. The result indicates that the oil gains have no authority to forecast the gains of slightly from all the sectors of Pakistan.

The investigation of Ghouse and Khan (2017) inspects the degree of combination and instability overflow influence amongst the Pakistani and driving unfamiliar financial exchanges by breaking down the Meteor exhibiter speculation. The investigation has utilized every day information from nine value marketplaces (KSE 100, NIKKEI 225, HIS, S&P 500, NASDAQ 100, DOW JONES, GADXI, FTSE 350 plus DFMGI) for the time of 2005 to 2014. The finding gives blended proof about co-developments amongst driving unfamiliar financial exchanges and the Pakistani financial exchange. The outcomes demonstrate unidirectional average and instability overflow influence from S & P 500, NASDAQ 100, DJI and DFMGI to KSE 100 while happening bidirectional overflow influence are accounted for DFMGI and KSE 100.

Further, Sui and Sun (2016) explained the active relationships among regional stock averages, foreign currencies, interest differentials, and U.S. S & P 500 gains. The investigation has used the data of India, Russia, China, Brazil, and South Africa (BRICS); The research has found prominent surplus consequences from foreign currency to averages in the period of short-run but not in the long run period. The conclusion of the investigation indicates that the surplus consequences amongst currency and average are momentous from 2007 to 2009.

Barrera, Mallory, and Garcia (2012) used futures marketplaces to inspect variability surplus in the US crude oil industry. The data was used in the analysis for five years, from 2006 to 2011. The findings shed light on the degree of uncertainty linkages amongst energy and agricultural marketplaces during a time marked by high value variability and prominent corn-based ethanol output.

Arouri, Jouini, and Nguyen (2011) use a generalised VAR-GARCH method to scrutinize the degree of variability transfer amongst oil and stock marketplaces in Europe and the United States at the sector degree. Their survey data for equity segments spans seven industries in Europe and the United States (Automobile and Parts, Financials, Industrials, Basic Materials, Technology, Telecommunications and Utilities). The findings exhibit that using cross-marketplace variability surplus estimated by VAR-GARCH models often conclusion in greater diversification and hedging efficacy than widely used multivariate variability models.

Jebran, Chen, Ullah, and Mirza (2017) inspect the variability surplus influence of Asian emerging marketplaces before and after the 2007 financial crisis. The thesis employed an expanded EGARCH model to analyse data from five Asian emerging marketplaces (Hong Kong, China, India, Pakistan, and Sri Lanka). The research disclosed a bidirectional variability surplus amongst the stock marketplaces in Indian and Sri Lankan or in both sub-eras. In either case, the variability overflow is bidirectional amongst Hong Kong and India; Pakistan and India in the pre-emergency time frame; Pakistan and Sri Lanka in the post-emergency timespan.

The overall average and uncertainty surplus amongst the stock marketplace and the currency marketplace was studied. Majumder and Nag (2015) conducted their research using the bivariate EGARCH model, which accurately captures the asymmetric reactions to disturbance. The report used data from the Indian economy from April Disturbance 2003 to September 2013. The average and variability surplus consequences from the stock marketplace to the currency marketplace were found to be statistically momentous. The research also disclosed signs of bidirectional variability surplus before and after the crisis.

The original Hamilton work (1983) has given the association of the oil value shock with the genuine side of the economy in light of the oil value stun of 1973 and thereafter, both hypothetical and exact writing advances around the stockpile side monetary elements. Nonetheless, the linkage amongst oil expenses and stock expenses have been scrutinized of late by numerous scientists and strategy producers like Jones and Kaul (1996); and Huang et al. (1996). The majority of these examinations utilized vector autoregressive (VAR) model. Huang et al. (1996), stated that oil value changes essentially affected the profits of oil area organizations, yet tracked down an in momentous effect of oil expenses on the general marketplace file. Jones and Kaul (1996) reasoned that securities exchanges in Canada and USA react through expected income channel altogether, expenses by using BEKK model particular of Engle combined with Kroner (1995) disclosed these overflows huge (Tansuchat et al., 2009; Malik and Hammoudeh, 2007; Ågren. As indicated by Sadorsky (1999), financial exchange gains are fundamentally influenced by both oil expense and its unpredictability. Afterward, Sadorsky (2001) revealed positive relationship among oil and stock gains. Nevertheless, these examinations principally depend upon VAR model and zeroed in on exploring the value overflows though unpredictability overflows have been overlooked. Some new examinations have focused on the instability linkages amongst oil expenses and stock expenses by using BEKK model detail of Engle and Kroner (1995) and disclosed these overflows huge (Tansuchat et al., 2009; Malik and Hammoudeh, 2007; Ågren, 2006; Ewing and Thompson, 2007). As per Ågren (2006), there is huge overflow from oil to securities exchanges of Norway, Japan, the US and the UK though for Sweden, it is immaterial. Malik and Hammoudeh (2007), while working on Gulf marketplaces, disclosed that oil value instability overflows fundamentally influence the securities exchanges though there is bi-directional unpredictability overflow in Saudi Arabia. Chang et al. (2009) utilized the multivariate GARCH model to scrutinize the instability linkages amongst future unrefined petroleum gains and the securities exchange gains of world oil organizations. These discoveries recommend no unpredictability overflow. Likewise, Chang et al. (2011) inspected the association among oil and stock value instability for oil organizations and disclosed no unpredictability overflow one or the other way. The writing gives restricted knowledge into the instability overflows at sectoral degree which is essential to scrutinize on the grounds that various areas of securities exchange carry on contrastingly to the oil value stun. Further, the writing for the most part overlooks the arising securities exchanges. Malik and Ewing (2009) found huge unpredictability overflow among oil and stock expenses of five areas of United States while they utilized BEKK model. Hamma et al. (2014), utilizing similar model, scrutinized the unidirectional instability for chose areas of financial exchange of Tunisia. Utilizing every day information Sattary et al. (2014) scrutinized the unpredictability amongst oil expense and areas of Turkish financial exchange (transport, non-metal mineral and power areas) under BEKK system, they found critical relationship amongst oil value instability and instability of stock expenses with the exception of non-metal mineral. Gencer and Demiralay (2014) scrutinized the instability overflows for different areas of financial exchange of Turkey and disclosed unpredictability overflow from oil marketplace to stock for all areas. Utilizing VAR-GARCH model for examining the unpredictability linkages among oil and stock, Arouri, Jouini, et al. (2011) supported the bidirectional transmittalof unpredictability in USA and unidirectional transmittalin Europe. Utilizing same model, Arouri et al. (2012) analyzed the transmittal of instability at sectoral degree for European marketplace. Their discoveries propose critical transmission. For Saudi securities exchange at sectoral degree, Jouini (2013) assessed VAR-GARCH model wherein he uncovered that there exists profit and unpredictability overflow among oil and stock expenses. As of late, Bouri et al. (2016) researched the association amongst first just as second snapshots of oil expenses and areas of Jordanian securities exchange and disclosed non-consistency of oil value influences on various areas. It is grounded that particular occasions influence the monetary business sectors anyway these occasions influence the conveyance. Utilizing same model, Arouri et al. (2012) inspected the transmittalof unpredictability at sectoral degree for European marketplace. Their discoveries propose critical transmission. For Saudi financial exchange at sectoral degree, Jouini (2013) assessed VAR-GARCH model wherein he uncovered that there exists profit and instability overflow among oil and stock expenses. As of late, Bouri et al. (2016) inspected of information and make exceptions which influence the entire assessment. Subsequently, these anomalies should be dealt with thoroughly. Numerous creators (Ané et al., 2008; Verhoeven and McAleer, 2000; Carnero et al., 2016; Charles, 2004; Charles and Darné, 2005, 2014; Laurent et al., 2016; Franses and Ghijsels, 1999; van Dijk et al., 1999) have contemplated the influence of anomalies hypothetically just as exactly on the instability gauges, trial of restrictive heteroscedasticity, imbalance, routineness states of the models, out of check figure and on portfolio advancement. This investigation added to existing experimental writing by assessing the influence of exceptions on the evaluations of profit and unpredictability, and their the directon of originss among oil and the PSX at sectroal degree. We applied an as of late proposed technique by Laurent et al. (2016) for the identification and rectification of anomalies. To amount the overflows amongst these two business sectors, we estimated the VARAGARCH model due to its ability to treat the two gains and volaitlity effectively.. It is momentous to fathom the elements of oil value stun for the economy. In any case, monetary business sectors are all the more firmly co connected with the oil value vacillations. Better comprehension of the effect expect alert to build up the model hypothetically, the degree of investigation, treatment of the anomalies and the most appropriate econometric model. In the current writing, we barely discover an examination where the wonders of profit and variability and its surplus have been scrutinized by taking into account the outliers in multivariate edifice amongst oil expenses and areas of value marketplace in the event of Pakistan.

Prior to global monetary emergency, there was a positive association amongst oil value expenses and dollar esteem. Chen and Chen (2007) contemplated the since quite a while ago run association amongst genuine oil expenses and genuine trade rates and reasoned that world oil expenses establish the predominant wellspring of swapping scale developments. Narayan et al. (2008) analyzed the association amongst oil expenses and the Fiji US conversion scale and reasoned that an ascent in oil expenses prompts an enthusiasm for the Fijian-dollar. Krugman (1983) and Golub (1983) report the possible significance of oil expenses as an informative variable of conversion scale developments. Kang et al. (2015) analyze the influences of global oil value stuns on the financial exchange profit and instability contemporaneous association utilizing a primary VAR model which they infer that the overflow file amongst the underlying oil value stuns and codivergence of stock profit and unpredictability is huge and profoundly genuinely huge.

Lucidly, Ratti and Vespignani (2016) express that global cash, global mechanical creation and global oil expenses are integrated. An ascent in oil expenses bring about huge expansions in global loan fees. Causality goes from global liquidity to oil expenses and from oil expenses to the global loan fee, global mechanical creation and global CPI. Positive stuns to global M21, to global CPI and to global mechanical creation lead to genuinely huge and persistent expansions in global oil expenses. Aloui et al. (2013) guarantee that the negative associationamongst the oil expenses and the expense of dollar can be clarified by the way that oil is a support versus rising expansion and fills in as a place of refuge versus developing danger.

In the investigation of Lizardo and Mollick (2010), integration checks and conjectures exhibit that expansions in genuine oil expenses lead to a huge devaluation of the USD dollar versus monetary forms of net oil sending out nations (Canada, Mexico and Russia). Then again the worth of dollar comparative with monetary forms of net oil bringing in nations, for example, Japan increments when the genuine oil expenses go up.

In addition, it is archived that oil stuns may unevenly affect macroeconomic factors. Federer (1996) and Lee et al. (1995) have disclosed that settlements of oil value unpredictability fundamentally influence macroeconomic factors.

After over twenty years of exploration on unpredictability determining, there is as yet momentous conflict on how instability ought to be demonstrated. One deferential illustration of instability determining is the perception that value gains and unpredictability are negative corresponded. The marvel can be clarified by an influence, or an instability criticism influence. Takaishi (2017) propose another ARCH-type model that utilizes a judicious capacity to catch the topsy-turvy reaction of unpredictability to gains, which is influence. Reasonably, we likewise incorporated investigation to discover the influence of stuns on stock gains of the momentous business major parts in to this examination.

Nitwits and Ing macroeconomic effect, product expenses, for example, oil have critical influences of organization stock gains. Jorion (1990) gauges conversion st and and openness of US multinationals over the era from January 1971 to December 1987. Blose and Shieh (1995) analyze the effect of gold expenses' progressions on the profits of gold mining stocks. Because of their discoveries the gold value affectability of a mining stock was disclosed to be more noteworthy than one. The theory of solidarity gold value affectability was not dismissed utilizing month to month information over the era 1981–1990 for an example of regularly exchanged organizations.

Those examinations control us to break down the effect of oil value instability on developing business sector monetary forms to comprehend the macroeconomics part of energy value developments since for the vast majority of those nations it is the main contribution of the entire financial aspects action.

Because of the consequences of the past writing there is a reasonable uneven conduct amongst oil expenses and different resources classes like organization values and monetary forms. Additionally since the influence of oil value stuns can be determined for quite a while era there are repeating influences on both microeconomics and macroeconomics markers. In this regard one of the urgent marks of this examination is that it incorporates the new oil value emergency era in the dataset. Narayan and

Narayan (2007) paper has all the earmarks of being the solitary eminent paper that has endeavored to exhibit oil value instability utilizing diverse sub eras to pass judgment on the power of their outcomes. This is the primary motivation behind why we will likewise utilize three sub eras in our investigation which will cover both 2008 global emergency and 2014 oil value emergency.

Various exploration papers have unequivocally analyzed the association amongst oil marketplaces and financial factors, for example, GDP development rates, swelling, work, and trade rates (Hamilton, 1983; Gisser and Goodwin, 1986; Mork, 1989; Hooker, 1996; among others). The effect of oil value changes on the world economy is in fact huge. As per Adelman (1993), "Oil is so critical in the global economy that gauges of financial development are regularly qualified with the proviso: 'If there is no oil shock.'" As another confirmation of that significance, the International Monetary Fund (2000) assessed that a US$5 per barrel expense increment consequences ly affected the condition of the economy with a decrease of global financial development by 0.3% in the next year.

Shockingly, while uderts and Ing the association amongst oil value changes and financial exchanges may seem pivotal to energy strategy arranging, energy hazard the executives and portfolio broadening, these connections have just been analyzed as of late. Jones and Kaul (1996) were quick to check the response of global securities exchanges (Canada, UK, Japan, and USA) to oil value stuns, in light of the st and ard income profit valuation model. They observe that for Canada and the US, this response can be completely reconfirmed by the effect of the oil stuns on capitals. Huang et al. (1996), utilizing an unhindered Vector Autoregressive (VAR) model, exhibit a huge association amongst the stock gains of certain American oil organizations and oil value changes. Be that as it may, there is no proof of a association amongst oil expenses and marketplace lists like the S&P 500. Interestingly, Sadorsky (1999), utilizing a Vector Autoregressive (VAR) edifice, indicates that oil expenses assume a momentous part in influencing monetary movement. His outcomes likewise recommend a lopsided relationship, as changes in monetary movement don't appear to affect oil expenses. Ciner (2001), utilizing non-direct causality checks, gives observational proof that oil stuns altogether influence stock file gains in the US in a non-straight way, and that the profits additionally affect unrefined petroleum prospects. Park and Ratti (2008) exhibit that oil value stuns essentially affect genuine stock gains contemporaneously or potentially inside the next month in the U.S. what's more, 13 European nations over the era running from January 1986 to December 2005 and that Norway, as an oil exporter, display a genuinely essentially sure reaction of genuine stock re-visitations of an oil expense increment.

All the more as of late, a few investigations have analyzed the degree of oil value influences on stock expenses from an area by area viewpoint. For instance, El-Sharif et al. (2005) exhibit that the stock gains of UK Oil and Gas organizations are emphatically connected to oil expense increments. Boyer and Filion (2007) acquire comparable outcomes for Oil and Gas gains in Canada. Arouri and Nguyen (2010), utilizing different econometric procedures, recommend that the affectability of European area stock re-visitations of oil expense changes enormously contrast starting with one area then onto the next, with Oil and Gas stocks benefitting from oil expense increments. Essentially, Arouri, Bellalah, and Nguyen (2011) exhibit that, based on transient investigation, solid positive connections are found in some GCC (Gulf Cooperation Council) nations amongst oil expenses and securities exchanges, and that this causality by and large runs from oil expenses to securities exchanges.

Notwithst and ing different examinations zeroing in on value overflows among oil and securities exchanges, it is as of late that some consideration has been paid to conceivable unpredictability overflows amongst these two business sectors. Utilizing a multivariate GARCH model, Malik and Hammoudeh (2005) discover huge unpredictability transmittal amongst second snapshots of the US value and global oil marketplaces. In that equivalent investigation, they track down that the three analyzed Gulf value marketplaces (Bahrain, Kuwait, and Saudi Arabia) get unpredictability from the oil marketplace, with Saudi Arabia highlighting a fascinating trademark, for example a huge instability overflow from the Saudi value marketplace to the global oil marketplace, underlining the momentous pretended by Saudi Arabia in the global oil marketplace. Agren (2006), utilizing a lopsided BEKK model, discovers solid proof of unpredictability overflows (though generally little) from oil expenses to financial exchanges in Japan, Norway, the UK, and the US. Malik and Ewing (2009) investigation unpredictability overflows amongst oil expenses and five US value area files (Financials, Industrials, Consumer Services, Health Care, and Technology) and finish up for huge transmittal of stuns and instability amongst oil expenses and a section of the inspected marketplace areas.

Utilizing a new summed up VAR-GARCH way to deal with inspect the degree of unpredictability transmittal among oil and securities exchanges in Europe and the US at the area degree, Arouri, Jouini, and Nguyen (2011) discover proof of huge instability overflow. Their investigation proposes that the transmittals typically unidirectional from oil marketplaces to financial exchanges in Europe, yet bidirectional in the US. Chang et al. (2012), utilizing different econometric models, inspect the restrictive connections and instability overflows amongst the unrefined petroleum and monetary business sectors, and discover little proof of unpredictability transmittal amongst the oil marketplace and momentous stock files (FTSE100, Dow Jones, and S&P500). These outcomes would will in general affirm that instability transmittal among oil and securities exchanges just happens in certain areas.

This writing survey is fundamentally specific and will center, past those papers as of now referenced as inspecting the association amongst oil value gains and nation degree stock value gains, on research because of oil value gains on sectoral stock value gains, on research because of oil value unpredictability on stock value gains, and on research because of oil value instability on stock value gains and unpredictability. Various papers have zeroed in on the influence of oil value stuns on the profits of the oil and gas area. Sadorsky (2001) and Boyer and Filion (2007) track down a positive critical association amongst oil value stuns stocks gains for Canadian oil and gas organizations, El-Sharif et al. (2005) report a similar outcome for UK oil and gas organizations as does Mohanty and Nandha (2011) for US oil and gas organizations. Dayanandan and Donker (2011) report that oil expense increments altogether affect the bookkeeping benefits of oil and gas organizations in North America. Ramos and Veiga (2011) scrutinize the profits of the oil and gas area in 34 nations and observe that area gains are altogether influenced by oil value gains. Nandha and Faff (2008) look at 35 global mechanical area records and observe that oil expense increments adversely sway all areas with the exception of the oil and gas areas. In an investigation of transport area in 38 nations, Nandha and Brooks (2009) observe that oil expenses contrarily affect gains in created economies and immaterial influences on gains in Asian and Latin American nations. Arouri (2011) researches the reaction of areas of European securities exchange lists to oil value changes and tracks down that most European financial exchange areas are responsive to changes in oil expenses yet that reactions shift generally across areas. Faff and Brailsford (1999) report that across 25 Australian areas the oil and gas and expanded assets ventures have a huge positive reaction to oil value stuns rather than a critical negative reaction to oil value stuns in the paper and bundling and banking and transport areas.

McSweeney and Worthington (2008) consider nine areas in the Australian securities exchange track down that higher oil expenses positively affect energy area gains and an adverse consequence in the banking, retailing, and transportation area. A few papers have straightforwardly assessed the influence oil value unpredictability on financial exchange gains. Sadorsky (1999) indicates that oil value stuns unpredictability created by a GARCH interaction assumes a part in clarifying the US genuine stock gains. Park and Ratti (2008) observe that for some European nations, however not for the US, expanded instability of oil expenses, estimated by month to month the amount of squared first log contrasts in every day spot raw petroleum expense, essentially pushes down genuine stock gains. A couple of papers in the space address the influence of oil value unpredictability on the instability of the stock value area gains.

Sadorsky (2003) considers oil value instability and discovers it as a huge factor in deciding stock profit unpredictability of the US innovation area. Hammoudeh et al. (2004) track down that raw petroleum value unpredictability is related with instability of the S&P oil area records. Hammoudeh et al. (2010) analyze the effect of oil expenses on the stock profit volatilities of 27 areas in the US and report that expansions in oil expenses increment the profit instability for areas that utilization oil seriously. Choi and Hammoudeh (2010) utilize a Markov-Switching GARCH model to gauge the switch consequently unpredictability among high and low systems for products (counting Brent oil and West Texas Intermediate oil) and the US financial exchange. Elyasiani et al. (2011) observe that oil value changes are momentous in deciding abundance stock gains in 9 out of 13 US securities exchange areas over December 1998 to December 2006.

CHAPTER 3

DATA DESCRIPTION AND METHODOLOGY

3.1 Data Description

The investigation inspects the gains and variability surand amongst world oil value and industry gains of Pakistan Stock Exchange (cement, chemical, oil, and gas refinery, Automobile assembler, Fertilizer, Paper and Board, Tobacco, sugar, textile, power generation) in Pakistan marketplace for the sample era of 19 years from July 1st 2000 to June 30, 2019. This investigation employs everyday closing rates[2] to inspect the variability transmittal from the oil marketplace to industrial gains. This investigation will employ the everyday data of crude oil for the sample era of 19 years from July 1st 2000 to June 2019 from the index Pakistan website.

3.1.1 Oil prices

Oil rates generally refer to the spot value of a barrel of benchmark crude oil—a reference value for buyers and sellers of crude oil. The major factors which have a direct influence on Oil Rates are marketplace sentiment, demand, and supply. When the supply decreases the demand increases and the value of oil escalate and vice versa. Oil supply depend upon on tax, legal scheme, and geological discovery, political situation of the oil-producing companies and the expense of extracting the oil. The oil demand depends upon on the macroeconomic circumstances of the globe.

The current investigation will employ everyday rates of oil from July 2000 to June 2019.

$$\gamma_t = \ln({}^{CO_t}/_{CO_{t-1}}) \tag{3.1}$$

Where, γ_t indicate profit at time "t", ln is a natural log, CO_t is current oil rates at time "t" and CO_{t-1} is oil rates at time "t-1".

[2] There are three value given i.e high, low plus closing value. Closing value is consider original transaction value.

3.1.2 Industry indices (11 industries)[3]

Table 3.1: Industry Indices

S No	Industry	Listed firms	Sample
1	Cement	20	15
2	Chemical	26	14
3	Refinery	4	4
4	Automobile Assembler	12	9
5	Fertilizer	6	5
6	Paper and Board	10	6
7	Tobacco	3	3
8	Sugar	29	18
9	Textile	123	48
10	Power generation	17	9
11	Oil and Gas	12	7
Total		**262**	**138**

3.2 Methodology

The methodology is branched into three parts. The first part is to measure average and variability surplus from oil sector rates to different industrial gains by using ARMA-GARCH in the average model. In the second part, ARMA-TGARCH and ARMA–EGARCH model is applied by considering the asymmetric effect of information. In the last part, the dynamic correlation is measured amongst oil rates and industrial gains by using a dynamic tentative correlation (DCC) and the asymmetric dynamic tentative correlation (ADDC) approach. An Augmented Dicky-fuller Testis used to check the stationary or non-stationarity which is existed or not existed in time series data.

[3] These industries are selected on the basis that selected industries consume more oil.

3.3 Econometric Model

The variability surplus amongst oil rates and industrial gains is scrutinized by using the ARMA-GARCH model.

3.3.1 ARMA-GARCH model

The investigation applies two-stage ARMA-GARCH in the Average model conferred by (Liu & Pan, 1997). It is accustomed to measure the transmittal of average and variability from oil rates to industrial gains. In the first step, the profit series of oil is modeled through the ARMA (1,1) GARCH (1,1) model.

$$r_{k,t} = \beta_0 + \beta_1 . r_{k,t-1} + \beta_2 . \upsilon_{k,t} + \beta_3 . \varepsilon_{k,t-1} + \varepsilon_{k,t}, \varepsilon_{k,t} \sim N(0, \upsilon_{k,t}) \quad (3.2)$$

$$\upsilon_{k,t} = \rho_0 + \rho_1 . \upsilon_{k,t-1} + \rho_2 . \varepsilon_{k,t-1}^2 \quad (3.3)$$

Where, $r_{k,t}$ are the everyday gains of oil rates at time t and $\epsilon_{k,t}$ is the residuary or error term. The major target to include the ARMA (1,1) GARCH edifice in the model is the settlement of serial correlation in the data.

In the later stage, average profit and variability surplus consequences across the sector are estimated by obtaining the standardized residuary and its square in the first stage and replacing them into average and variability equation of other industry as follow:

$$r_{j,t} = \beta_{j,o} + \beta_{j,1} . r_{j,t-1} + \beta_{j,2} . \upsilon_{j,t} + \beta_{j,3} . \varepsilon_{j,t-1} + \lambda_j . \varepsilon_{k,t} + \varepsilon_{j,t}, \varepsilon_{j,t}, \sim N(0, \upsilon_{j,t}) \quad (3.4)$$

$$\upsilon_{j,t} = \rho_{j,o} + \rho_{j,1} . \upsilon_{j,t-1} + \rho_{j,2} . \varepsilon_{j,t-1}^2 + \gamma_j . e_{k,t}^2 \quad (3.5)$$

Where, $\epsilon_{k,t}$ is the error term for oil rates and is apprehending the average profit surplus effect from all these sources. To inspect variability surplus, exogenous variable $e_{k,t}^2$ – is the standardize error term's square of the is incorporated in the tentative variability equation and is outlined as $e_{k,t} = \frac{\varepsilon_{k,t}}{\sqrt{\upsilon_{k,t}}}$

3.3.2 ARMA -TGARCH Model

Threshold Generalized Autoregressive Tentative Heteroscedasticity (TGARCH) model created by Glosten (1994) and Zakoian, Jagannathan and Runkle (1993). This model is stronger than the ARCH (Autoregressive Tentative Heteroscedasticity) and GARCH (Generalized Autoregressive Tentative Heteroscedasticity) models. Curve and GARCH details are symmetric as in both positive and negative stuns of a similar size are blessed to receive have similar influence by the square of the residuary. The TGARCH model, then again, is fit for checking for any measurably critical contrast amongst when the stun is positive and when it is negative. This model expects to catch imbalances regarding negative and positive stuns. To do this, essentially add into the change condition a multiplicative faker variable to check whether there is a measurably critical contrast when stuns are negative.

The specification of ARMA-TGARCH in the average model is given as follow:

$$r_{k,t} = \beta_0 + \beta_1 . r_{k,t-1} + \beta_2 . \upsilon_{k,t} + \beta_3 . \epsilon_{k,t-1} + \varepsilon_{k,t}, \varepsilon_{k,t} \sim N(0, \upsilon_{k,t}) \quad (3.6)$$

$$\upsilon_{k,t} = \rho_0 + \rho_1 . \upsilon_{k,t-1} + \rho_2 . \varepsilon^2_{k,t-1} + \rho_2 . \varepsilon^2_{k,t-1} * D_t \quad (3.7)$$

Where, $r_{k,t}$ are the everyday gains of oil rates at time t and $\varepsilon_{k,t}$ is the residuary or error term.

In the second stage, average profit and variability surplus consequences across the sector are estimated by obtaining the standardized residuary and its square in the first stage and replacing them into average and variability equation of other sectors as follow:

$$r_{j,t} = \beta_{j,o} + \beta_{j,1} . r_{j,t-1} + \beta_{j,2} . \upsilon_{j,t} + \beta_{j,3} . \varepsilon_{j,t-1} + \lambda_j . \varepsilon_{k,t} + \varepsilon_{j,t}, \varepsilon_{j,t}, \sim N(0, \upsilon_{j,t}) \quad (3.8)$$

$$\upsilon_{j,t} = \rho_{j,o} + \rho_{j,1} . \upsilon_{j,t-1} + \rho_{j,2} . \varepsilon^2_{j,t-1} + \rho_{j,3} . \varepsilon^2_{j,t-1} * D_t + \gamma_j . e^2_{k,t} \quad (3.9)$$

Where, $\varepsilon^2_{j,t-1} * D_t$ tells us about asymmetric of data. Where, standardize error term for oil rates and is countering the average profit surplus effect from all these sources? For inspection of variability surplus, exogenous variable $e^2_{k,t}$ – the square of standardized error term is incorporated in the tentative variability equation and further outlined as $e_{k,t}=\frac{\varepsilon_{k,t}}{\sqrt{\upsilon_{k,t}}}$

3.3.3 ARMA-EGARCH

The exponential GARCH (EGARCH) model differs from the GARCH divergence edifice because of the log of the divergence. In EGARCH a negative shock leads to a higher tentative divergence in the following era than a positive shock (Poon & Granger, 2003). EGARCH is the oldest asymmetric model, first of all, it was discussed by (Harvey & Shephard, 1996). It is the logarithm of tentative variability to capture the asymmetric effect of good and bad news. It studies the asymmetric behavior of data. It distinguishes the size and momentous effect. This model tells us how smaller and larger disturbance create more variability and it tells about how good news and bad news are different from each other in creating variability in the marketplace. As equation is on divergence so, this model does not require any restrictions on parameters on the positivity of divergence is already done so, this is the main benefit of using this model. ARMA-EGARCH in the average model as explained below:

$$r_{k,t} = \beta_0+\beta_1.r_{k,t-1} + \beta_2.\upsilon_{k,t} + \beta_3.\varepsilon_{k,t-1}+\varepsilon_{k,t}, \varepsilon_{k,t} \sim N(0, \upsilon_{k,t}) \quad (3.10)$$

$$ln\sigma^2_{k,t} = \gamma_o + \gamma_1 \frac{|\mu_{k,t-1}|}{\sigma_{k,t-1}}+\gamma_2 \frac{\mu_{k,t-1}}{\sigma_{k,t-1}} + \gamma_3 ln\sigma^2_{k,t-1} \quad (3.11)$$

Where, $r_{k,t}$ are the everyday gains of oil sector at time t and $\epsilon_{k,t}$ is the residuary or error term. In the second stage, average profit and variability surplus consequences across sector are estimated by obtaining the standardized residuary and its square in the first stage and replacing them into average and variability equation of other sectors as follow:

$$r_{j,t} = \beta_{j,o} + \beta_{j,1}.r_{j,t-1} + \beta_{j,2}.\upsilon_{j,t} + \beta_{j,3}.\varepsilon_{j,t-1} + \lambda_j.\varepsilon_{k,t} + \varepsilon_{j,t}, \varepsilon_{j,t}, \sim N(0, \upsilon_{j,t}) \quad (3.12)$$

$$ln\sigma^2_{j,t} = \gamma_o + \gamma_1 \frac{|\mu_{j,t-1}|}{\sigma_{j,t-1}}+\gamma_2 \frac{\mu_{j,t-1}}{\sigma_{j,t-1}} + \gamma_3 ln\sigma_{j,t-1} + \gamma_j.e^2_{j,t} \quad (3.13)$$

Where, $\varepsilon_{k,t}$ is the standardized error term for oil rates and is capturing the average profit surplus effect from these sources. To inspect variability surplus, the exogenous variable $e_{k,t}^2$ – the square of standardize error term is incorporated in tentative variability equation and is outlined as $e_{k,t}=\frac{\varepsilon_{k,t}}{\sqrt{\upsilon_{k,t}}}$.

In the above equation $ln\sigma_{j,t-1}$ is error term if it's signed is negative, it indicates bad news and tells that actual profit is low. $\frac{|\mu_{j,t-1}|}{\sigma_{j,t-1}}$ tells about sign effect. Its significance or insignificance provides whether larger disturbance create more variability or vice-versa. $\frac{\mu_{j,t-1}}{\sigma_{j,t-1}}$ also tells about sign effect. Its significance and insignificance explain whether bad news creates more variability or good news creates more volatility. $\gamma_j. e_{j,t}^2$ tells about variability surplus.

3.3.4 DCC & ADCC GARCH Models

Engle (2002) later provides the concept of dynamic Tentative Codivergence DCC GARCH model in which the assumption of time-varying tentative correlation is introduced rather than Constant Tentative Correlation (CCC). A momentous benefit of utilizing this model is the recognition of potential changes in restrictive connections over the long run. Another advantage of DCC-GARCH model is that it estimates correlation coefficients of the standardized residuary and so accounts for heteroscedasticity directly (Chiang et al., 2007).

The work of Engle (2002) is further extended by Cappiello, Engle and Sheppard (2006) in which they provide another concept of the Asymmetric Dynamic Tentative Correlation ADCC GARCH model (Zakoian, 1994)it is seen that marketplace variability of the same sample size reflects more consequences of the negative disturbance rather than positive disturbance. In the univariate GARCH model proposed by Engle and Ng (1993) these asymmetric behaviors are broadly discussed. Nevertheless, there exists limited literature on the behavior of asymmetric correlation among the stock marketplaces but global financial crises give it more importance concerning negative disturbance and more turbulence.

The mathematical representation of Dynamic Tentative Correlation is given below:

$$Q_t = \bar{R} + \sum_{i=1}^{m} \pi i(\varepsilon_{t-i}\varepsilon_{t'-i} - \bar{R}) + \sum_{i=1}^{m} \varepsilon_i \,(Q_{t-1} - \bar{R}) \tag{3.14}$$

The mathematical representation of Asymmetric Dynamic Tentative Correlation is as follow:

$$\sigma_t = \min(\varepsilon_t, 0)\,, \bar{N} = \frac{1}{T}\sum_{t=1}^{T} \sigma_t\, \sigma_t' \tag{3.15}$$

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Descriptive Statistics

This section will denote the conclusion of the investigation. First, the descriptive statics is conferred which tells about the behavior of data. Table 4.1 represents the summary statistic of all variables. All of the series exhibit excess kurtosis indicating skewed and asymmetrical behavior. The average value of all industries gains is almost zero. The profit of refinery and power industries have average profit equal to zero. The maximum value for the tobacco industry is highest as compared to other industries while fertilizer industry which has lowest value as compared to the other industries. The minimum value for the textile industry has smallest value as compare to the minimum values of other industries while paper industry has the largest value of minimum among all industries. Furthermore, the tobacco industry has the largest standard deviation whereas the power industry has the lowest standard deviation among all industries. The textile, refinery, paper and oil and gas are the industries having largest positive or negative skewed distribution.

Table 4.1: Descriptive Statistics for all sectors for the era of 2000 to 2019

	TOB	FERT	R_CEME	R_CHEM	R_POWER	R_AUTO
Average	0.083122	0.015538	0.024978	0.039673	0.008235	0.050632
Maximum	120.0368	4.91757	19.62857	31.57365	8.52851	48.74658
Minimum	-123.1036	-7.515109	-20.2366	-33.29467	-8.377449	-47.96282
Std. Dev.	4.219586	1.060978	1.772613	1.525956	0.931486	1.819805
Skewness	-0.100623	-0.353153	0.286445	-0.856059	-0.089531	0.085166
Kurtosis	585.3791	6.230518	12.374	102.9415	11.58491	234.5349

Note: TOB is the everyday gains of tobacco sector, FERT is the everyday gains of fertilizer sector.

	R_TEX	R_REF	R_PAPER	R_SUGAR	R_OANDG	OP
Average	0.032314	0.0023	0.013198	0.038632	0.013676	0.01418
Median	0.022004	0	0.023854	0.026007	0.019612	0.018758
Maximum	83.61642	35.45957	92.5343	82.31085	9.283212	16.40973
Minimum	-87.5045	-68.8484	-135.2835	-69.95544	-31.04515	-16.5445
Std. Dev.	2.325142	2.374129	3.435614	2.124014	1.242678	2.297174
Skewness	-6.84248	-5.14586	-16.03085	-0.0552	-3.639047	-0.09666
Kurtosis	908.5654	191.3361	928.3855	873.7633	89.22325	7.040919
Jarque-Bera	1.60E+08	6928509	1.67E+08	1.48E+08	1458175	3187.357
Probability	0	0	0	0	0	0
Sum	151.0363	10.75038	61.68797	180.5667	63.91981	66.27754
Sum Sq. Dev.	25263.56	26339.3	55157.49	21081.94	7216.278	24659.46
Observations	4674	4674	4674	4674	4674	4674

Table 4.2: ADF Test Results

Series	t-Stat	Prob.	E(t)	E(Var)	Lag
R_TOB	-25.069	0.0000	-1.456	0.818	14
R_FERT	-64.769	0.0001	-1.532	0.735	0
R_CEME	-58.988	0.0001	-1.532	0.735	0
R_CHEM	-77.562	0.0001	-1.532	0.735	0
R_POWER	-73.891	0.0001	-1.532	0.735	0
R_AUTO	-20.651	0.0000	-1.456	0.818	11
R_TEX	-23.906	0.0000	-1.456	0.818	12
R_REF	-40.487	0.0000	-1.514	0.754	2
R_PAPER	-17.773	0.0000	-1.456	0.818	27
R_SUGAR	-18.744	0.0000	-1.456	0.818	25
R_OANDG	-46.616	0.0001	-1.530	0.745	1
OP	-75.849	0.0001	-1.532	0.735	0

4.2 Stationarity of Series

All profit series of all sectors are exhibit in below graphs. It can be observed that all series have constant average and divergence as there are negligible observations which have large spread. The graph of oil rates is little bit confusing because the spread is not looking constant but the check of unit root may guide correctly regarding its stationarity. The graphs of the series also depict that all industries have couple of outliers which can affect distribution of dataset but in order to verify whether all series are stationary or not, graphs of all series are shown (see appendix A).

The table 4.2 display the conclusion of Augmented Dickey Fuller check. The conclusion of ADF illustrate that all return series of different sectors are stationary at degree. The t-statistic is less than the critical value of ADF therefore the void hypothesis exhibiting existence of unit root is rejected and alternative hypothesis is accepted exhibiting series are stationary at degree. The p-value for each series is also less than 5% exhibiting that void hypothesis of unit root is rejected.

4.3.1 ARMA GARCH Models

Table 4.3: Automobile Sector

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	0.000710	0.009768	0.072716	0.9420
C	0.035194	0.022039	1.596899	0.1103
R_AUTO(-1)	0.500228	0.040557	12.33387	0.0000
UT_AUTO(-1)	-0.253883	0.033662	-7.542209	0.0000
UTM	0.001042	0.014365	0.072526	0.9422
Divergence Equation				
C	0.084054	0.003998	21.02494	0.0000
RESID(-1)^2	0.191362	0.004540	42.14604	0.0000
GARCH(-1)	0.824991	0.003193	258.3407	0.0000
UTV	-0.046117	0.008047	-5.731101	0.0000

The table 4.3 illustrates the average and volatility overflow effect in case of automobile industry. The upper section of table displays the average equation while lower section of table displays the divergence equation of the model. The average equation is exhibiting that there is no average surplus effect of oil market volatity on automobile industry. The p-value of average UTV in upper section of the table is greater than 5 percent exhibiting that it is in momentous. The equation of divergence depicts that the p-value of UTV is less than one percent illustrating momentous and negative influence of variability therefore there is negative variability surplus effect from oil market volatity to automobile sector.

Table 4.4: Cement Sector

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	0.009307	0.016867	0.551788	0.5811
C	0.023679	0.039154	0.604775	0.5453
R_CEME(-1)	0.235022	0.106175	2.213544	0.0269
UT_CEME(-1)	-0.104782	0.105863	-0.989789	0.3223
UTM	-0.002244	0.017589	-0.127594	0.8985
Divergence Equation				
C	0.128392	0.009814	13.08297	0.0000
RESID(-1)^2	0.101688	0.005242	19.39717	0.0000
GARCH(-1)	0.856491	0.007550	113.4352	0.0000
UTV	-0.007392	0.010966	-0.674041	0.5003

The table 4.4 illustrates the average and volatility overflow effect in case of cement sector. The upper section of table displays the average equation while lower section of table displays the divergence equation of the model. The average equation is exhibiting that there is no average surplus effect of oil market volatity on cement sector. The p-value of average UTV in upper section of the table is greater than 5 percent exhibiting that it is in momentous. The equation of divergence depicts that the p-value of UTV is also greater than five percent illustrating in momentous and no influence of variability therefore there is no variability surplus effect from oil market volatity to automobile sector.

Table 4.5: Chemical Sector

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	0.000943	0.015327	0.061546	0.9509
C	-0.000566	0.027119	-0.020877	0.9833
R_CHEM(-1)	0.994823	0.243802	4.080460	0.0000
UT_CHEM(-1)	-0.934824	0.244038	-3.830644	0.0001
UTM	-0.046686	0.013858	-3.368918	0.0008
Divergence Equation				
C	0.157110	0.006516	24.11249	0.0000
RESID(-1)^2	0.169560	0.006169	27.48698	0.0000
GARCH(-1)	0.766999	0.007910	96.96849	0.0000
UTV	-0.004038	0.005811	-0.694842	0.4872

The table 4.5 illustrates the average and volatility overflow effect in case of chemical sector. The upper section of table displays the average equation while lower section of table displays the divergence equation of the model. The average equation is exhibiting that there is negative and momentous average surplus effect of oil market volatity on the chemical sector. The p-value of average UTV in upper section of the table is less than 5 percent exhibiting that it has negative and momentous effect. The equation of divergence depicts that the p-value of UTV is greater than five percent illustrating in momentous and no influence of variability therefore there is no variability surplus effect from oil market volatity to chemical sector.

Table 4.6: Fertilizer Sector

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	0.001527	0.024343	0.062742	0.9500
C	0.030787	0.021417	1.437489	0.1506
R_FERT(-1)	0.046052	0.147800	0.311579	0.7554
UT_FERT(-1)	0.054713	0.148449	0.368566	0.7125
UTM	-0.001280	0.011010	-0.116268	0.9074
Divergence Equation				
C	0.034225	0.002946	11.61548	0.0000
RESID(-1)^2	0.128388	0.006498	19.75956	0.0000
GARCH(-1)	0.825552	0.006623	124.6540	0.0000
UTV	0.054959	0.003841	14.30883	0.0000

The table 4.6 illustrates the average and volatility overflow effect in case of fertilizer sector. The upper section of table displays the average equation while lower section of table displays the divergence equation of the model. The average equation is exhibiting that there is no average surplus effect of oil market volatity on fertilizer sector. The p-value of average UTV in upper section of the table is greater than 5 percent exhibiting that it is in momentous. The equation of divergence depicts that the p-value of UTV is less than five percent illustrating momentous and positive influence of variability therefore there is positive variability surplus effect from oil market volatity to fertilizer sector.

Table 4.7: Paper Sector

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.007191	0.011642	0.617680	0.5368
R_PAPER(-1)	1.227954	0.068006	18.05647	0.0000
UT_PAPER(-1)	-1.059775	0.065597	-16.15574	0.0000
UTM	0.035571	0.007058	5.039787	0.0000
		Divergence Equation		
C	0.055030	0.006305	8.727809	0.0000
RESID(-1)^2	0.798371	0.017013	46.92703	0.0000
GARCH(-1)	0.728719	0.000794	917.6312	0.0000
UTV	-0.060049	0.006697	-8.966262	0.0000

The table 4.7 illustrates the average and volatility overflow effect in case of paper sector. The upper section of table displays the average equation while lower section of table displays the divergence equation of the model. The average equation is exhibiting that there is positive and momentous average surplus effect of oil market volatity on paper sector. The p-value of average UTV in upper section of the table is less than 5 percent exhibiting that it has momentous effect. The equation of divergence depicts that the p-value of UTV is less than five percent illustrating momentous and negative influence of variability therefore there is negative variability surplus effect from oil market volatity to paper sector.

Table 4.8: Power Sector

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	0.108163	0.057853	1.869637	0.0615
C	-0.038830	0.027369	-1.418760	0.1560
R_POWER(-1)	-1.260772	1.136103	-1.109735	0.2671
UT_POWER(-1)	1.269826	1.137672	1.116161	0.2644
UTM	-0.010405	0.010764	-0.966604	0.3337
		Divergence Equation		
C	0.061344	0.003630	16.89951	0.0000
RESID(-1)^2	0.100300	0.005450	18.40233	0.0000
GARCH(-1)	0.820952	0.008918	92.05626	0.0000
UTV	0.003624	0.003104	1.167600	0.2430

The table 4.8 illustrates the average and volatility overflow effect in case of Power sector. The upper section of table displays the average equation while lower section of table displays the divergence equation of the model. The average equation is exhibiting that there is no average surplus effect of oil market volatity on Power sector. The p-value of average UTV in upper section of the table is greater than 5 percent exhibiting that it is in momentous. The equation of divergence depicts that the p-value of UTV is also greater than five percent illustrating in momentous and no influence of variability therefore, there is neither average nor variability surplus effect from oil market volatity to Power sector.

Table 4.9: Refinery Sector

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000846	0.031931	0.026508	0.9789
R_REF(-1)	0.264290	0.100268	2.635829	0.0084
UT_REF(-1)	-0.113324	0.101385	-1.117764	0.2637
UTM	-0.045268	0.024688	-1.833614	0.0667
		Divergence Equation		
C	0.270848	0.013781	19.65349	0.0000
RESID(-1)^2	0.021323	0.000835	25.53979	0.0000
GARCH(-1)	0.936673	0.003385	276.6817	0.0000
UTV	-0.222252	0.005806	-38.27844	0.0000

The table 4.9 illustrates the average and volatility overflow effect in case of refinery sector. The upper section of table displays the average equation while lower section of table displays the divergence equation of the model. The average equation is exhibiting that there is negative and momentous average surplus effect of oil market volatity on refinery sector. The p-value of average UTV in upper section of the table is less than 5 percent exhibiting that it has momentous effect. The equation of divergence depicts that the p-value of UTV is less than five percent illustrating momentous and negative influence of variability therefore both have negative and momentous average and variability surplus effect from oil market volatity to refinery sector.

4.3.2 ARMA Models across Industries

Table 4.10: Oil and Gas Sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.006323	0.015970	0.395923	0.6922
R_OANDG(-1)	0.475682	0.123092	3.864436	0.0001
UT_OANDG(-1)	-0.369375	0.123855	-2.982310	0.0029
UTM	0.004433	0.015889	0.278987	0.7803

The table 4.10 illustrates the average overflow effect in case of oil and gas sector. Since there is no arch effect in case of oil and gas sector, therefore no divergence equation is estimated above in the table. The above table display the average equation and it is exhibiting that there is in momentous co-efficient of average surplus effect. The p-value of average UTV in the table is greater than 5 percent exhibiting that it has in momentous effect. The average effect of surplus is in momentous from oil market volatity to oil and gas sector.

Table 4.11: Sugar Sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.019184	0.029405	-0.652403	0.5142
R_SUGAR(-1)	1.555787	0.302923	5.135913	0.0000
UT_SUGAR(-1)	-1.513792	0.303233	-4.992174	0.0000
UTM	0.029117	0.027306	1.066329	0.2863

The table 4.11 illustrates the average overflow effect in case of sugar sector. Since there is no arch effect in case of oil and gas sector, therefore no divergence equation is estimated above in the table. The above table display the average equation and it is exhibiting that there is in momentous co-efficient of average surplus effect. The p-value of average UTV in the table is greater than 5 percent exhibiting that it has in momentous effect. The average effect of surplus is in momentous from oil market volatity to sugar sector.

Table 4.12: Textile Sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.053885	0.040577	1.327979	0.1842
R_TEX(-1)	-0.865633	0.967634	-0.894587	0.3710
UT_TEX(-1)	0.851685	0.967733	0.880083	0.3789
UTM	0.040632	0.029916	1.358185	0.1745

The table 4.12 illustrates the average overflow effect in case of textile sector. Since there is no arch effect in case of oil and gas sector, therefore no divergence equation is estimated above in the table. The above table display the average equation and it is exhibiting that there is in momentous co-efficient of average surplus effect. The p-value of average UTV in the table is greater than 5 percent exhibiting that it has in momentous effect. The average effect of surplus is in momentous from oil market volatity to textile sector.

Table 4.13: Tobacco Sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.702066	0.068337	10.27352	0.0000
R_TOB(-1)	-8.591045	0.586990	-14.63575	0.0000
UT_TOB(-1)	8.618567	0.587144	14.67879	0.0000
UTM	0.085911	0.053201	1.614827	0.1064

The table 4.13 illustrates the average overflow effect in case of tobacco sector. Since there is no arch effect in case of oil and gas sector, therefore no divergence equation is estimated above in the table. The above table display the average equation and it is exhibiting that there is in momentous co-efficient of average surplus effect. The p-value of average UTV in the table is greater than 5 percent exhibiting that it has in momentous effect. The average effect of surplus is in momentous from oil market volatity to tobacco sector.

4.3.3 DCC and ADCC GARCH Models

Table 4.14: AUTO-OP DCC(1,1) Model with univariate GARCH fitted in the 1st step Estimation Method

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	0.008620	0.005250	1.642078	0.1006
theta(2)	0.946404	0.029790	31.76865	0.0000

Log likelihood	-20304.59	Schwarz criterion	7.658239
Avg. log likelihood	-1.910121	Hannan-Quinn critter.	7.649382
Akaike info criterion	7.644625		

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.14 elaborates results of DCC GARCH model between oil prices and Automobile Assemblers industry. This table reports the past residuals shock (θ_1) impact and the lagged and dynamic conditional correlation (θ_2) with their p-values. The first DCC model's condition is to observe its stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). The automobile industry successfully meets the requirement. It shows, the DCC model is used for measuring the time volatility conditional correlation. Parameters of θ_1 has been found insignificant for Automobile Assemblers industry. This insignificant variation implies that, there is no existence of the past residual shudders on correlation. The Parameters of θ_2 is found highly significant for Automobile Assemblers industry that indicates, there exists the lagged dynamic conditional correlation in this industry.

AUTO-OP ADCC GARCH

Problem in estimation

Ceme DCC and ADCC

Unable to estimate in EViews

Table 4.15: CHEM-OP DCC (1,1) Model with univariate GARCH fitted in the 1st step Estimation Method: ARCH Maximum Likelihood

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	0.003453	0.004647	0.743156	0.4574
theta(2)	0.954250	0.095565	9.985354	0.0000
Log likelihood	-19855.25	Schwarz criterion		7.489156
Avg. log likelihood	-1.867850	Hannan-Quinn critter.		7.480298
Akaike info criterion	7.475541			

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.15 shows results of DCC GARCH model between oil prices & Chemical industry. This table reports the impact of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2) with their respective p-values. The first condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). The Chemical industry successfully meets the required stability condition. It shows, DCC model must be used for measuring the time varying conditional correlation. Parameters of θ_1 is found insignificant for Chemical industry. This insignificant variation implies that, there is no existence of the impact of past residual shocks on correlation. Parameters of θ_2 has been found to be highly significant for Chemical industry that indicates, there exists the lagged dynamic conditional correlation in this industry.

Table 4.16 CHEM-OP Asymmetric DCC(1,1) Model with univariate GARCH fitted in the 1st step

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	0.002057	0.004915	0.418549	0.6755
theta(2)	0.925196	0.094449	9.795741	0.0000
theta(3)	0.005471	0.008799	0.621793	0.5341
Log likelihood	-19854.91	Schwarz criterion		7.493869
Avg. log likelihood	-1.867818	Hannan-Quinn criter.		7.482596
Akaike info criterion	7.476541			

Table 4.17: FERT-OP DCC(1,1) Model with univariate GARCH fitted in the 1st step

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	-0.007520	1.28E-07	-58784.63	0.0000
theta(2)	0.780802	0.000180	4344.937	0.0000
Log likelihood	-17056.30	Schwarz criterion		6.435930
Avg. log likelihood	-1.604544	Hannan-Quinn criter.		6.427072
Akaike info criterion	6.422315			

* Stability condition: theta(1) + theta(2) < 1 is met.

Table 4.17 ellaborates the results of DCC GARCH model between oil prices & fertilizer industry. This table reports the effect of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2) with their respective p-values. The first condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). This industry successfully meets the required stability condition. It means, DCC model must be used for measuring the time varying conditional correlation. Parameters of θ_1 has been found significantly negative w.r.t. fertilizer industry which shows a highly significant correlation. The significant variation implies that, there exists the impact of past residual shocks on correlation. Parameters of θ_2 found to be highly significant for fertilizer industry which shows that, there exists the lagged dynamic conditional correlation in this industry.

Table 4.18 FERT-OP Asymmetric DCC(1,1) Model with univariate GARCH fitted in the 1st step

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	-0.001408	0.005623	-0.250427	0.8023
theta(2)	0.430642	0.394374	1.091964	0.2748
theta(3)	0.026888	0.019038	1.412334	0.1579
Log likelihood	-18265.42	Schwarz criterion		6.895755
Avg. log likelihood	-1.718290	Hannan-Quinn criter.		6.884482
Akaike info criterion	6.878428			

* Stability condition: theta(1) + theta(2) < 1 is met.

Table 4.18 covers the estimates of ADCC GARCH model between oil prices and Fertilizer industy. The first two parameters of this table are same as that of DCC GARCH models i.e. the impact of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2). An additional parameter (θ_3) is used in this model that provides the information about the shocks of positive and negative news on dynamic conditional correlation. Like previous model of DCC, the first condition that is the stability of model is also met in all industries (i.e. $\theta_1 + \theta_2 < 1$). It means, the model is stable. The parameters of θ_1 is found insignificant for Fertilizer industry. The Parameters of θ_2 is also found insignificant for Fertilizer industry which indicates that, there does not exist the lagged dynamic conditional correlation in Fertilizer industry. The parametric values of θ_3 also show an insignificant impact for Fertilizer industry that indicates, no variations with respect to asymmetric effect. In short, any good or bad news arises in market, didn’t affect the correlation.

Oil and Gas –OP DCC and ADCC

Table 4.19 Paper-Oil DCC System: 2-Step DCC(1,1) Model with univariate

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	-0.000640	2.18E-07	-2937.653	0.0000
theta(2)	0.788157	0.042188	18.68188	0.0000
Log likelihood	-21448.61	Schwarz criterion		8.088726
Avg. log likelihood	-2.017743	Hannan-Quinn critter.		8.079869
Akaike info criterion	8.075112			

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.19 indicated the results of DCC GARCH model between oil prices and paper industry. This table reports the effect of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2) with their respective p-values. The first condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). This industry successfully meets the required stability condition. It shows, DCC model must be used for measuring the time varying conditional correlation. Parameters of θ_1 has been found to be significantly negative for paper industry shows a highly significant correlation. The significant variation implies that, there exists the impact of past residual shocks on correlation. Parameters of θ_2 is found to be highly significant for paper industry that indicates the existence of the lagged dynamic conditional correlation in this industry.

Paper –OP ADCC

Not working in eviews

Table 4.20: POWER-OP DCC(1,1) Model with univariate GARCH fitted in the 1st step

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	-0.003636	0.003480	-1.044857	0.2961
theta(2)	0.979026	0.034002	28.79282	0.0000
Log likelihood	-17690.66	Schwarz criterion		6.674634
Avg. log likelihood	-1.664220	Hannan-Quinn critter.		6.665776
Akaike info criterion	6.661019			

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.20 shows the results of DCC GARCH model between oil prices & Power industry. This table reports the effect of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2) with their respective p-values. First condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). The Power industry successfully meets the required stability condition. It means, DCC model must be used for measuring the time varying conditional correlation. Parameters of θ_1 for power industry has been found insignificant. This insignificant variation implies that, there is no existence of the impact of past residual shocks on correlation. The Parameters of θ_2 is found to be highly significant for Power industry indicates existence of the lagged dynamic conditional correlation in this industry.

Power- OP ADCC

Results not available in eviews.

Table 4.21: REF-OP DCC(1,1) Model with univariate GARCH fitted in the 1st step

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	0.014539	0.015605	0.931686	0.3515
theta(2)	0.104662	0.452444	0.231325	0.8171
Log likelihood	-22623.84	Schwarz criterion		8.530959
Avg. log likelihood	-2.128301	Hannan-Quinn critter.		8.522101
Akaike info criterion	8.517344			

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.21 shows the results of DCC GARCH model between oil prices and Refinery industry. This table reports the impact of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2) with their respective p-values. The first condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). The Refinery industry successfully meets the required stability condition. It means, DCC model must be used for measuring the time varying conditional correlation. Parameters of θ_1 is found insignificant for Refinery industry. This insignificant variation implies that, there is no existence of the impact of past residual shocks on correlation. Parameters of θ_2 is also found insignificant for Refinery industry which indicates that, there does not exist the lagged dynamic conditional correlation in this industry.

Ref- OP ADCC

Not available in EViews

Table 4.22: SUGAR-OP DCC(1,1) Model with univariate GARCH fitted in the 1st step

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	0.005898	0.004844	1.217561	0.2234
theta(2)	0.961326	0.030738	31.27508	0.0000
Log likelihood	-19529.88	Schwarz criterion		7.366720
Avg. log likelihood	-1.837242	Hannan-Quinn critter.		7.357863
Akaike info criterion	7.353106			

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.22 shows results of DCC GARCH model among oil prices & Sugar industry. This table reports the effect of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2) with their respective p-values. The first condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). The Sugar industry successfully meets the required stability condition. It means, DCC model must be used for measuring the time varying conditional correlation. The parameters of θ_1 for Sugar industry has been found insignificant. This insignificant variation implies that, there is no existence of the impact of past residual shocks on correlation. Parameters of θ_2 is found to be highly significant for Sugar industry which indicates the existence of the lagged dynamic conditional correlation in this industry.

Sugar – OP ADCC

Conclusion not available in EViews.

Textile – OP DCC and ADCC

Conclusion not available in EViews.

Table 4.23: TOBACCO-OP DCC(1,1) Model with univariate GARCH fitted in the 1st step Tobacco-Oil Value DCC & ADCC

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	0.011266	0.024296	0.463672	0.6429
theta(2)	0.686545	0.415075	1.654028	0.0981
Log likelihood	-24108.30	Schwarz criterion		9.089549
Avg. log likelihood	-2.267949	Hannan-Quinn critter.		9.080691
Akaike info criterion	9.075935			

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.23 elaborates the results of DCC GARCH model among oil prices & Tobacco industry. This table reports the effect of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2) with their respective p-values. The first condition of DCC model is to check the stability condition as it must be less than 1 (i.e. $\theta_1 + \theta_2 < 1$). The Tobacco industry successfully meets the required stability condition. It means, DCC model must be used for measuring the time varying conditional correlation. Parameters of θ_1 has been found insignificant for Tobacco industry. This insignificant variation implies that, there is no existence of the effect of past residual shocks on correlation. The Parameters of θ_2 is found to be significant for Tobacco industry which indicates the existence of the lagged dynamic conditional correlation in this industry.

Table 4.24: TOBACCO-OP Asymmetric DCC(1,1) Model with univariate GARCH fitted in the 1st step ACCA

	Coefficient	Std. Error	z-Statistic	Prob.
theta(1)	0.009641	0.026341	0.365995	0.7144
theta(2)	0.688721	0.420440	1.638097	0.1014
theta(3)	0.003687	0.029508	0.124945	0.9006
Log likelihood	-24108.29	Schwarz criterion		9.094388
Avg. log likelihood	-2.267948	Hannan-Quinn critter.		9.083115
Akaike info criterion	9.077061			

* Stability condition: theta (1) + theta (2) < 1 is met.

Table 4.24 covers the estimates of ADCC GARCH model between oil prices and Tobacco industry. The first two parameters of this table are same as that of DCC GARCH models i.e. the effect of the past residual shocks (θ_1) and lagged dynamic conditional correlation (θ_2). An additional parameter (θ_3) is used in this model that provides the information about the shocks of positive and negative news on dynamic conditional correlation. Like previous model of DCC, the first condition that is the stability of model is also met in all industries (i.e. $\theta_1 + \theta_2 < 1$). It means, the model is stable. The parameters of θ_1 is found insignificant for Tobacco industry. The Parameters of θ_2 is also found insignificant for Tobacco industry which indicates that, there does not exist the lagged dynamic conditional correlation in Fertilizer industry. The parametric values of θ_3 also show an insignificant impact for Tobacco industry that indicates, no variations with respect to asymmetric effect. In short, any good or bad news arises in market, didn't affect the correlation.

CHAPTER 5

CONCLUSION AND POLICY RECOMMENDATION

The targets of the investigation are to inspect the gains and variability surplus amongst world oil value and industry gains of Pakistan Stock Exchange (cement, chemical, oil, and gas refinery, Automobile assembler, Fertilizer, Paper and Board, Tobacco, sugar, textile, power generation) for the sample era of 19 years from July 1st 2000 to June 30, 2019. This investigation utilized everyday closing rates to inspect the variability transmittal from the oil marketplace to industrial gains. The everyday data of crude oil has been used for the sample era of 19 years from July 1st 2000 to June 2019 extracted from the index Pakistan website. The methodology of this is branched into three parts. The first part is to measure average and variability surplus from oil sector rates to different industrial gains by using ARMA-GARCH in the average model. In the second part, ARMA-TGARCH and ARMA –EGARCH model is applied by considering the asymmetric effect of information. In the last part, the dynamic correlation is measured amongst oil rates and industrial gains by using a dynamic tentative correlation (DCC) and the asymmetric dynamic tentative correlation (ADDC) approach. The conclusion of the estimates reveal that average equation is exhibiting that there is no average surplus effect of oil market volatity on cement sector, Power, fertilizer, sugar, textile, tobacco, oil and gas sectors and automobile industry. The average equations are also exhibiting that there are negative and momentous average surplus consequences of oil market volatity on the refinery and chemical sector. Lastly, the average equation indicates that there is positive and momentous average surplus effect of oil market volatity on paper sector. It is also deduced that therefore there are no variability surplus consequences from oil market volatity to chemical sector and power sector, positive variability surplus consequences from oil market volatity to fertilizer sector, negative variability surplus effect from oil market volatity to automobile sector, paper sector and refinery sector but no ARCH consequences existed in case of oil and gas sector. Ultimately, it is found that nowadays volatilities of sectors profit such as automobile profit, power profit, paper profit, refinery profit, fertilizer profit, chemical profit, tobacco profit and oil value profit are responsive to their own preceding volatilities.

5.1 Limitations and Future Directions of the Study

The main concern of the current study is to examine the variability surplus from the oil marketplace to the industry profit of Pakistan and to discuss the time-varying corrections of the oil marketplace to the industrial profit of PSX. In addition, the focus of the current study is also to investigate the possibilities of asymmetric behavior of correlation amongst the oil marketplace and industry profit of Pakistan marketplace. The current study has several limitations which could be used by researchers to do further research on the concern topic. It is discussed that the current study has focused on the oil market place of Pakistan so it is also possible o compare the oil market place of Pakistan with the international market.

In addition, the current study has focused on to examine the Volatility Transmission from Oil Market to Industry Returns by using data from 2000 to 2019. So, the findings of the study will be more reliable if the researcher will add more data. Moreover, the current study is limited to the DCC, ADCC, and GARCH Model because it has used these models to analyze the volatility transmission from oil market to industry return, so it is also possible for the researchers to compare these models with each other or using another model.

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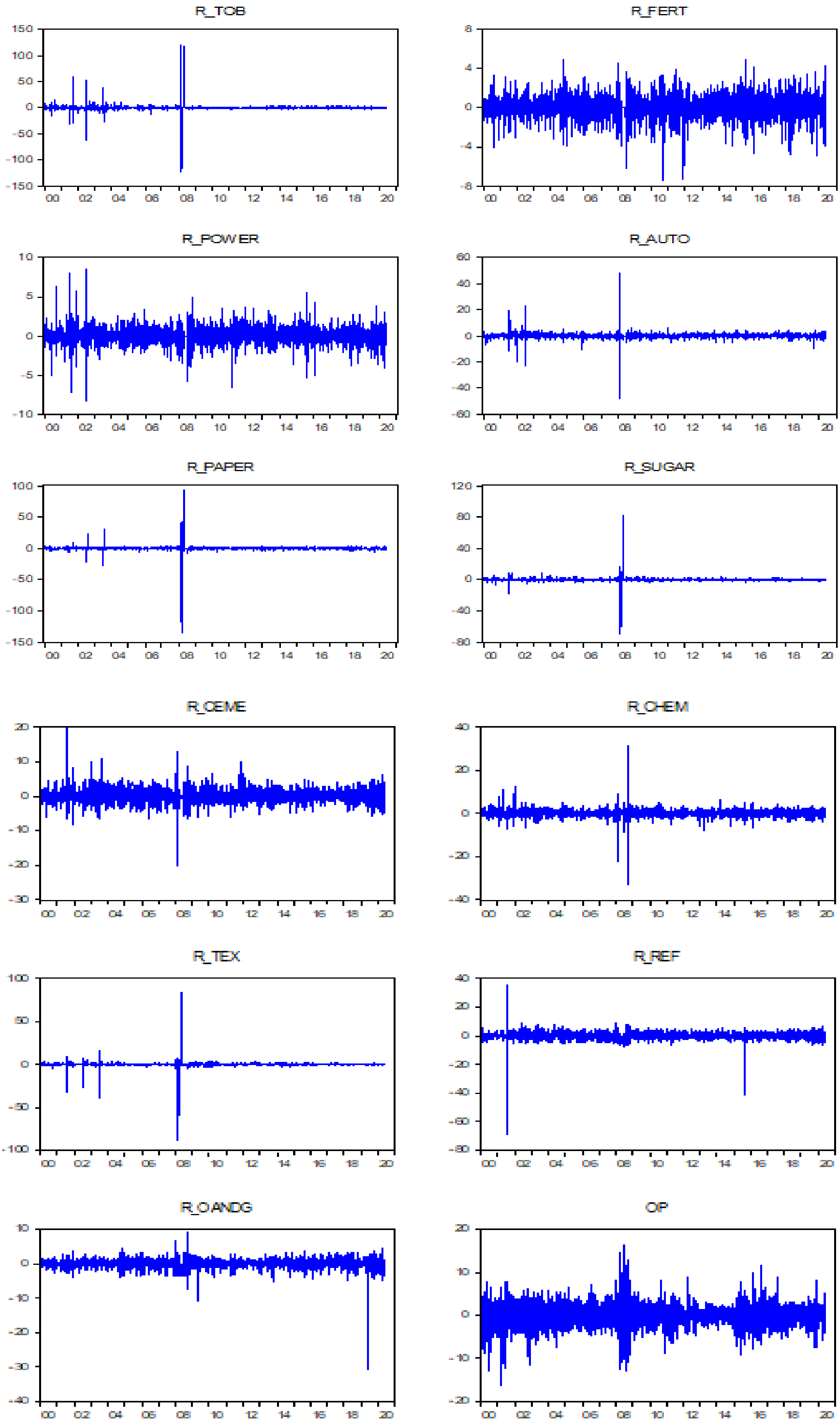
APPENDIX A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