

The Impact of OPEC Conferences announcements on Oil Prices from 2005 – 2014

This dissertation has been completed on partial fulfilment of the M.B.S. (E&F) at Waterford Institute of Technology



Waterford Institute of Technology

School of Graduate Business

Waterford Institute of Technology

Written and Completed By: Ayodele Odesola

Supervised by: Mr John Casey

Date of Submission: 22nd August 2016

I declare that this dissertation is wholly my own work except where I have explicit reference the work of others. I have read the Structured Masters Programs Research Policy, Procedures and Guidelines (2013) hereby declare that this thesis is in line with these requirements.

I have uploaded the entire proposal as one file to Turnitin in Moodle, examined my 'Originality Report' by viewing the detail behind the overall 'Similarity Index', and have addressed any matches that exceed 3%. I have made every effort to minimise my overall 'Similarity Index' score and the number of matches occurring.

Due to a research proposal previously written last year in preparation for this dissertation, there is one section over 3% referring back to this within the Turnitin program. It has been clarified that the content within this research proposal is all my own work and that no plagiarism has been incurred. I have made effort to minimise my overall 'Similarity Index' score and the number of matches occurring.

Signed: _____

Ayodele Odesola

22nd August 2016

Abstract

From the time OPEC was founded in 1960, many research papers have been written on the influences the organisation has on the oil markets. The research problem stems from the fact that many academic scholars have clashed in their arguments on the influence of OPEC. While some have argued that OPEC influence on the world oil is diminishing as a result of fracking especially from the U.S, others stated that the oil market is reacting to market volatility as a result of the slowdown in Chinese economy which will eventually clear out and hasn't diminished the influence of the cartel.

Moreover, the drastic recent fall in oil prices since September 2014, has made the topic ever more interesting for consideration.

The writer intends to assess the level to which OPEC influences the global oil markets. Therefore the research question that is put forward is “*what is the impact of the OPEC Conference announcement on oil prices?*”

With data (WTI crude oil prices) from 2005 to 2014, the researcher adopts event study methodology and find that OPEC announcements do not influence oil prices in all the cases examined except when market expectations is wrong. However, when the outlier is removed from the data set when the market expectation is wrong the finding is in line with the rest of the cases considered in this study.

Acknowledgement

First of all, I would like to thank my brother who has been of great support throughout my years of studies in Waterford Institute of Technology. Words are not enough to express my gratitude for your endless supports, motivation and prayers over the years. Also, I will like to thank my mother and sister for their supports and prayers. It is worth mentioning that being far away from home and family has been very hard. However, the supports and love I receive from my girlfriend has made huge difference by making me feel at home. And for you papa, even though you are gone you will forever live in my heart and all you have taught me will always be guide. I miss you greatly.

I would like to thank my supervisor Mr. John Casey for his tremendous supports throughout the course of writing this dissertation. This work would not have been completed if not for him. I have acquired great knowledge working with him and I will forever be grateful to him.

I would like to thank my programme coordinator Dr. Sheila O' Donohoe, who has been of great help from the very start of this programme.

Lastly, I would like to thank all the masters students. Working with them has been phenomenon.

Table of Contents

Chapter One	Introduction	1
1.1	Overview	1
1.2	Background of the Study	1
1.3	Rationale for the Study	2
1.4	Limitations of this Study	3
1.5	Dissertation Layout	3
Chapter Two	Literature Review	4
2.1	Introduction	4
2.2	The Global Oil Market	4
2.3	Previous Studies on the Impact of OPEC Announcements	5
2.2.1	The Impacts of OPEC Announcements	5
2.2.2	The efficiency of OPEC as a Cartel	6
2.4	Theoretical Basis – Economics of Cartels	7
2.4.1	The Legality of Cartel	7
2.5	Efficient Market Hypothesis (EMH)	8
2.5.1	Is the oil market efficient?	9
2.6	A Brief History of OPEC	9
2.6.1	Structure of OPEC	10
2.6.2	OPEC the World Recognised Cartel	12
2.6.3	OPEC Announcements	13
2.7	Recent Oil Price	14
2.7.1	Why is the oil price so low?	14
2.7.2	Impacts of the fall in oil prices	16
2.8	Conclusion	18
Chapter Three	Research Methodology	19

3.1 Introduction	19
3.2 Literature Gap, Research Questions and Objectives	19
3.2.1 Literature Gap	19
3.2.2 Research Question and Research Objectives	20
3.3 Event Study Literature	22
3.3.1 Event Study Procedure	23
3.3.2 Models for measuring Abnormal Returns	23
3.4 Justification for the Event and Estimation Window	25
3.4.1 Event Window	25
3.4.2 Estimation Window	25
3.5 Testing Protocols	26
3.6 Sample Selection Process & Size	26
3.6.1 Sample Selection Process	26
3.6.2 Sample Size	26
3.7 Data Description	26
3.8 Data Verification/Cleaning	27
3.9 Market Expectation on OPEC Announcements	27
3.10 Extreme drop in the oil prices around 151 st and 166 th meetings	28
3.11 Limitations	28
4.12 Conclusions	29
Chapter Four Findings	30
4.1 Introduction	30
4.2 The Nature of OPEC meetings	30
4.2.1 Outcome of OPEC Meetings	31
4.3 Oil Price Reaction to OPEC meetings	32
4.3.1 Oil Price reaction to full OPEC meetings	32
4.3.2 Treatment of outliers in this study	34

4.3.3 Oil price reaction without the presence of outliers.....	35
4.4. Oil Price Reaction and Types of OPEC Decision	36
4.4.1 Oil Price Reaction when OPEC Decision is Unchanged.....	37
4.4.2 Oil Price Reaction when OPEC Decision is Increase.....	38
4.4.3 Oil Price reaction when OPEC Decision is Decrease.....	40
4.5 Market Expectations.....	41
4.5.1 Summary of Market Expectations	41
4.5.2 When Market Expectation is Correct	42
4.5.3 When Market Expectation is Correct without the Presence of Outliers.....	43
4.5.4 When Market Expectation is Incorrect.....	45
4.5.5 When Market Expectation is Incorrect without the Presence of Outlier.....	47
4.5.6 T-Test for Market Expectations.....	48
4.6 Conclusion.....	49
Chapter Five Discussions	50
5.1 Introduction	50
5.2 Summary of Previous Studies	50
5.3 Oil Price Reaction to OPEC Meetings	51
5.4 Oil Reaction and Type of OPEC Decision.....	52
5.4.1 No Change in Production Quota.....	52
5.4.2 Increase in Production Quotas.....	52
5.4.3 Cut in Production Quotas	53
5.5 Market Expectations.....	53
5.5.1 When the market got it right.....	53
5.5.2 When the market got it wrong	54
5.5.3 The Source of Market Expectations	54
5.6 The Diminishing Influence of OPEC	55
5.6.1 OPEC Indiscipline and Lack of Mechanism of Sanction	55

5.6.2 The Emergent Production of Non-OPEC Countries and Its Effects	56
5.6.3 OPEC and Its Place in the Economic and Geopolitical World.....	57
5.7 Chapter Summary.....	57
Chapter Six Conclusion	58
6.1 Chapter Overview	58
6.2 Summary of Research Findings	58
6.3 Limitations	59
6.4 Recommendations	59
Bibliography	60
Appendices	65
Appendix A: Personal Reflection.....	65
Appendix B: Oil price	67
Appendix C: OPEC Announcements on Production Quotas	72
Appendix D: OPEC Production Discrepancies	73
Appendix E: World Total Oil Supply (Million Barrels Per Day) from 2005 to 2014	74
Appendix F: Oil Price Movements.....	74
Appendix G: Oil Price Movements	77
Appendix H: Unchanged Production Quotas	80
Appendix I: Increase in Production Quotas	81
Appendix J: Cut in Production Quota	82
Appendix K: Market Expectations	83
Appendix L: Sources of Market Expectations	84
Appendix M: Correct Market Expectations	85
Appendix N: Correct Market Expectations	87
Appendix O: Incorrect Market Expectations	89
Appendix P: Incorrect Market Expectations	91
Appendix Q: T-Test on Market Expectations	92

Appendix R: List of Abbreviations	94
---	----

Word Count of main document: 16331

Chapter One Introduction

1.1 Overview

In this chapter the researcher will give a brief summary of the dissertation and the area of research. The layout of this chapter is as follows; Section 1.2 outlines the background to the study and gives a broad overview of what the dissertation is based upon. Section 1.3 identifies the rationale behind conducting the study. Session 1.4 outlines the limitations of this study. Finally, session 1.5 concludes by providing a summary of the layout of the dissertation.

1.2 Background of the Study

This study examines the impact of OPEC announcements on oil prices using a sample of thirty-three OPEC meetings. The study covers a period of ten years from 1st January 2005 to 31st December 2014. The OPEC announcements usually come at the end of both official conferences and ministerial meetings. This is the period when OPEC makes its decision on oil quotas known to the public by giving press conference usually on the last day of the meeting. The main purpose of this study is to examine the impact of OPEC announcements on oil prices. This is determined by examining the abnormal returns on oil prices around the time of the announcements. The abnormal returns can be derived by comparing changes in the oil prices during the estimation period which is 30-day period and the event window which is a 20-day period. The 20-day period is subdivided into;

- 10 days before the announcements and 10 days after the announcements.
- 5 days before the announcements and 5 days after the announcements.
- 2 days before the announcement and 2 days after the announcements.
- 1 day before the announcements and 1 day after the announcements.

1.3 Rationale for the Study

Oil is one of the most significant energy sources on the globe. Its contributions to the global economic growth and how it affects the geopolitical policies of countries cannot be underestimated.

From the time OPEC was founded in 1960 (Draper D. , 1984), many research papers have been written on the influences the organisation has on the world oil markets (Adelman, 2002). More than 80% of the globe's proven oil reserves are found in OPEC countries, with an estimate of 66% of those reserves from the Middle East (opec.org, 2014). This positioned the organisation as a reckoning force on the global stage. In recent times, many academic scholars have clashed in their arguments on the influence of OPEC on the world oil market. While some have argued that OPEC influence on the world oil is diminishing as more oil supply comes from non-OPEC countries such as the U.S and Canada, others stated that the oil market is reacting to market volatility as a result of the slowdown in Chinese economy which will eventually clear out and hasn't diminished the influence of the cartel.

While there have been many studies on the impact of OPEC announcements on oil prices, there seems to be a complete absence of research that examine the impact of market expectations around the time of OPEC announcements or consider the effect of the recent lifting the international sanctions on Iran, a country with huge oil reserves and a member of OPEC. It is this gap in the literature that this dissertation intends to fill. Moreover, the recent plunge in oil prices since September 2014 has made the topic ever more interesting for consideration. From this, the main objectives of this dissertation include the following;

- To examine oil price changes around OPEC announcements, taking into consideration the corresponding rate of oil prices at the period of the announcement.
- To examine if the level of impact is subject to the type of decision announced.
- To examine oil price changes around OPEC announcements taking into consideration prior market expectations and the corresponding level of oil prices at the period of the announcement.

1.4 Limitations of this Study

The sample size of thirty-three meetings used by the researcher is just a little bit above the recommended sample size of thirty. Moreover, the media coverage of the OPEC meetings is inconsistent. Some OPEC meetings have very little media coverage which makes it difficult to get the precise market expectations prior to OPEC quota announcement.

1.5 Dissertation Layout

This dissertation is made up of six chapters which are as follows;

Chapter one introduces the aim of this research area, including the rationale and the background of the study. It also lay out the main objectives of the study.

Chapter two provides an extensive review of the literature on the impact of OPEC announcements on oil prices.

Chapter three provides an inclusive account of the methodology adopted in this study, with emphasis on secondary research design, research question, research objectives and the limitations encountered during the course of this study.

Chapter four presents the findings that are discovered from the data analyses.

Chapter five elaborates the findings that are derived from the secondary data analysis.

Chapter six provides some conclusions based on the complete study conducted and recommendations for further research upon this study are expressed.

Chapter Two Literature Review

2.1 Introduction

This chapter will expound on the previous studies on OPEC announcements. The Chapter is laid out as follows; section 2.2 discusses the global oil market. Section 2.3 presents the previous studies on the impact of OPEC announcements on oil price. Section 2.4 considers the theoretical basis – economics of cartels. Section 2.5 talks about the efficient market hypothesis (EMH). Section 2.6 provides a brief history of OPEC. Section 2.7 discusses the recent fall in oil price. Last of all, section 5.6 gives a summary of the chapter.

2.2 The Global Oil Market

The United States uses 19 million barrels of oil every day, followed by China 10.3 million, Japan 4.5 million and the United Kingdom 1.5 million (Ahmed, 2015). According to the US EIA, each day the amount of oil consumed around the globe amounts to 91.2 barrels. The world's metropolitan population increases by 1.5 million every other week which is likely to add to the overall global usage of oil as a good number of developing countries shift from an agrarian economy to an industrialised one (Ahmed, 2015).

There has been drastic increase in the global demand for oil due to the growth of the so called “emerging seven” economies notably; China, India, Brazil, Russia, Indonesia, Mexico and Turkey (Ahmed, 2015).

The number of automobiles is estimated to increase by 50% from about 1.2 billion in 2015 to about 2.4 billion by 2035 – with the developing world accounting for around 80% of that growth. Added to this, about 90% of those vehicles will be run on oil (Ahmed, 2015). This shows the importance of oil to the survival of human existence.

The year 2015 saw the price of oil plummeted to levels not witnessed in over a decade as the oil price fell from \$118 per barrel in July 2014 to \$35 per barrel by December 2015 due to oversupply of oil and falling global demand (BBC News: January, 2016).

In the past forty years there have been four notable oil crises – 1973, 1979, 1990 and 2008. These periods of oil shock were marked by global economic downturn as oil prices skyrocketed (Aasim, et al., 2015). One can conclude that a fall in oil price should enhance the global economic growth, as there is reduction in the costs of oil and energy products for consumers and businesses in the oil importing countries which will overshadow the losses incurred by the oil producing countries (Aasim, et al., 2015). However, the indication since the decline of oil price from its peak of \$115 a barrel in August 2014 (The Economist, 2014), is not in line with this notion – or not at the moment. The anticipated benefits that come with fall in oil prices has not been matched with any significant global economic growth in the recent oil price collapse. Major oil producing countries have felt the brunt of the fall in oil prices on their economic growth resulting to such countries having to readjust their budget to accommodate the shock. On the other hand, there hasn't been sufficient evidence of increase in consumer spending or huge corporate investments in oil importing countries (BBC News: January, 2016).

2.3 Previous Studies on the Impact of OPEC Announcements

Previous academic research on the impact of OPEC meetings on oil prices has examined two vital subjects. These are;

- ✓ The impact of OPEC announcements
- ✓ The efficiency of OPEC as a cartel

Each of these aspects will be examined below.

2.2.1 The Impacts of OPEC Announcements

The first is the information content of the meetings. Draper (1984) examines the reaction of heating oil futures around organisation announcements and state that stakeholders have properly predicted OPEC conference outcomes and echo their anticipation on oil prices before OPEC meetings take place (Draper D. , 1984). Draper did his research by means of an event study. Firstly, the data he worked with was from 1978 to 1980, a range of two years, after the establishment of the heating oil contract on NYMEX (Lin & Tamvakis, 2009).

Secondly, the OPEC announcements are observed through their effect on the heating oil contracts, a refined goods whose connection to OPEC crude prices is perhaps distorted by refining economic and government guidelines (Lin & Tamvakis, 2009).

Guidi et al. (2006) examined the importance of OPEC meetings on stock markets rather than on oil prices by comparing the behaviours of both the US and the UK stock markets to OPEC quota during the periods of conflicts and non-conflicts from 1986 to 2004 (Lin & Tamvakis, 2009). They found that there are asymmetric reactions to OPEC policy decisions during conflict periods for the US and UK stock markets. Conversely, in non-conflict period evidence suggests that the oil markets incorporate OPEC decisions efficiently. Sharon Lin and Michael Tamvakis (2009) examined OPEC announcements and their effects on crude oil prices. Their study found variation in the degree and significance of market reactions to OPEC quota agreements under various price bands. Harald Schmidbauer & Angi Rosch (2009) did their study on OPEC news announcements and oil price volatility. They examined to what extent OPEC influences global oil market and found evidence of aftermaths of OPEC announcements on anticipated returns. They also found that there is substantial increase in oil price volatility prior to an OPEC announcement being made; the strength of this effect depending on the kind of decision. Likewise, Horan et al. (2004) studied the implied volatility of crude oil options and found that OPEC has a significant effect on oil price.

2.2.2 The efficiency of OPEC as a Cartel

A second body of research dealt with the argument whether OPEC is an efficient cartel. Loderer in his 1985 journal “A test of the OPEC cartel hypothesis” tested the assumption of OPEC’s cartel influence for each of the organisation meetings that occurred through the period of 1974-1983 (Lin & Tamvakis, 2009). Loderer finds mixed evidence that the organisation was manipulating oil prices.

Gulen (1996) and Alhajji & Huettner (2000) examined if OPEC is an efficient cartel by controlling oil production and influencing. Gulen (1996) finds some connection between OPEC production and oil prices. On the other hand, Alhajji & Huettner (2000) do not find any significant indication that OPEC can be classified as a dominant player in the oil market (Lin & Tamvakis, 2009).

2.4 Theoretical Basis – Economics of Cartels

A cartel is an agreement among competitors not to compete with one another and to engage in anticompetitive behaviour which enables them to exercise market power that they would not otherwise have if the agreement has not been put in place (Ljiljana, 2015). What a cartel is and its mode of operation has attracted many research studies and investigations during the last several decades. The reason for this surge in cartel research can be attributed to the developments in antitrust legislations in the United States and the European Union in the 1990s (Espen, 2014). According to Deborah Spar, cited by (Espen, 2014), economists stated five elements that are significant in determining the establishment of producer cartels. These include; concentration of production in the hands of few, a small number of outside producers who are not part of the cartel, high barrier to entry, non-substitutability and non-differentiation. The effectiveness of a cartel depends on its ability to dominate the market, have discipline and be able to prevent competitors from entering the market (The Economist, 2014). These factors will be examined in the context of the OPEC Cartel under the heading ‘OPEC the World recognised Cartel’.

2.4.1 The Legality of Cartel

In most countries, formal agreements among organisations to fix prices, set quantities and decide sales rules are bluntly illegal (Connor & Bolotova, 2006). Consumers and economic efficiency will be at a disadvantage when companies charge high-competitive prices and at the same time reduce output instead of competing on the market (Calvani, Cseres, & Ehlermann, 2006). The dangers posed by cartels are highlighted by the trial of both physical and legal persons and the growing debate on cartel illegalisation in the European Union Law (Pekarskiene & Bruneckiene, 2015). In 2014, the EU fined Philips, Infineon, and Samsung a total of €138m for forming a smartcard chip cartel in Europe between 2003 and 2005 (Rte, 2014). The penalties in the U.S anticompetitive system include high corporate fines and damages claims, as well as individual’s fines of up to \$1 million, and maximally ten years of imprisonment for culprits within the companies guilty of anticompetitive acts (Calvani, Cseres, & Ehlermann, 2006). The Irish stance on cartel has been equally fierce.

In 2007, Denis Manning the secretary of the Irish Ford Dealers' Association was fined €30,000 and sentenced to one-year jail after he was found guilty by a Circuit Criminal Court judge of aiding Ford dealers to operate a secret price cartel (Irish Examiner, 2007). The scheme involved setting prices for new cars purchased for cash but also involved fixing delivery charges for cars and commercial automobiles. While passing his judgement, the judge described the behaviour of the Irish Ford Dealers' Association as a classic cartel aimed to corrupt the market and squeeze customers of cars (Independent , 2007).

2.5 Efficient Market Hypothesis (EMH)

EMH is one of the utmost prominent and well-known contemporary financial concepts that look into market efficiency (Kehinde, 2012). It states that all significant information is swiftly integrated in stock prices as it emerges (Malhotra, Tandon, & Tandon, 2015). Ever since the EMH was put forward by Eugene Fama over forty years ago, it has been a subject of controversy. Academic and experimental literature on EMH gives different indications. Even in recent times the accuracy of the efficient market hypothesis has been questioned by many financial analysts (Kehinde, 2012). According to (Malkiel, 2005), some critics believe that on many instances market prices do not reveal available information and made reference to the 1990s technology-internet rapid expansion that resulted to massive anomalies in the stock market in the late 1990s to early 2000 and at the same time hold that technical analysis has some ability to forecast upcoming price movement. On the other hand, the supporters are of the opinion that even if investors do have the ability to predict upcoming price movement, the prediction is still irrelevant as there is no profit left after the transaction costs have been considered (Malkiel, 2005).

EMH is advocating that that price will adjust to new changes in information without any bias, thereby; investors are unable to make excessive returns on their investments (Malhotra, Tandon, & Tandon, 2015).

Fama defined EMH as follows “It is a market where there are large numbers of rational, profit ‘maximisers’ aggressively competing, with each trying to predict future values of individual securities, and where vital information is virtually freely accessible to all participants” (Mehwish & Yasir, 2015).

2.5.1 Is the oil market efficient?

In the 1980s, the oil market was subjected to instability in the prices of crude oil (Manning, 1991). Much hasn't change today as the oil market is once again faced with dealing with the recent fall in oil prices. The prices of oil have been very volatile, unpredictable, altering their paths and behaviour in line with the changes in the economic environment (Amelie & Olivie, 2009). There are huge increasing and decreasing movements in the oil prices which are mainly caused by variations in demand, exploration costs and reserves (Pindyck, 1999). Oil demands is determined by the consumption of oil from both developed and developing countries, while oil supply is determined by geopolitical events such as OPEC decisions on quotas, the Gulf War, the 2003 invasion of Iraq by the US, and oil tank levels (Amelie & Olivie, 2009).

Lately, Tobak and Cajueiro (2007), Alvarez-Remirez et al. (2008) and Maslyul and Smith (2009) examined the efficiency of crude oil markets and concluded that the market is efficient (Amelie & Olivie, 2009).

Moreover, (Yudong & Li, 2010) after combining the multiscale analysis with the technique of rolling windows to examine the efficiency of WTI crude oil market concluded that the small variations of WTI crude oil price can be predicted; nevertheless, the large variations had high uncertainty, both in the short and long term period.

2.6 A Brief History of OPEC

OPEC was established in Baghdad, the Capital of Iraq, with the signing of an agreement by the five founding members namely Islamic Republic of Iran, Iraq, Kuwait, Saudi Arabia and Venezuela in September 1960. The oil cartel was later joined by Qatar (1961), Indonesia (1962), Libya (1962), the United Arab Emirate (1967), Algeria (1969), Nigeria (1971), Ecuador (1973), Gabon (1975) and Angola (2007) (opec.org, 2015). At present, the cartel has a total of 12 Member Countries, after Ecuador, Gabon and Indonesia either terminated their membership or suspended it (opec.org, 2015).

OPEC produces about 40% of the world's crude oil and its exports amount to about 60% on the global market (Matsumoto, Voudouris, Stasinopoulos, & Di Maio, 2012).

2.6.1 Structure of OPEC

There are three main institutions of OPEC, which are referred to organs in the Article 9 of the 2012 Statute of the cartel and they include; the Conference, the Board of Governors, and the Secretariat.

The Conference is the highest authority of the organisation and it is made up of national delegations, usually headed by the member-state ministers with a portfolio including oil, energy or mining (Lin & Tamvakis, 2009). The Conference is the body that determines the production quotas of OPEC. Its responsibilities are as follow;

- ✓ To formulate the general policy of the organisation and determine the appropriate ways and means of its implementation.
- ✓ To decide upon any application for membership of the organisation.
- ✓ To confirm the appointment of Members of the Board of Governors.
- ✓ Approve any amendments to the Statute.
- ✓ Consider and decide upon the Budget of the organisation, as submitted by the Board of Governors (opec.org, 2015).

The Board of Governors are made up of Governors nominated by the Member States and the appointment must be confirmed by the Conference. Each Member of the organisation should be represented at all meetings of the Board of Governors; however, a quorum of two-thirds shall be necessary for holding of a meeting. The responsibilities of the Board of Governors are as follows:

- ✓ To direct the management of the affairs of the organisation and the implementation of the decisions of the Conference
- ✓ To submit reports and make recommendations to the Conference on the affairs of the organisation
- ✓ To consider and decide upon any reports submitted by the Secretary General
- ✓ Draw up budget of the organisation for each calendar year and submit it to the Conference for approval (opec.org, 2015).

The Secretariat is responsible for carrying out the executive functions of the organisation under the supervision of the Board of Directors. It is headed by the secretary general and the functions of the secretariat are as follows:

- ✓ To organise and administer the work of the organisation
- ✓ Ensure that the functions and duties assigned to the different departments of the secretariat are carried out
- ✓ Prepare reports for submission to each members of the Board of Governors concerning matters which call for consideration and decision
- ✓ Ensure the due performance of the duties which may be assigned to the Secretariat by the Conference or the Board of Governors (opec.org, 2015).

2.6.2 OPEC the World Recognised Cartel

Having a deeper look at the Article 2 of the organisation statute clearly indicates the intention of OPEC to exert a monopolistic power in the oil market.

Article 2 of OPEC:

- A. *“The principle aim of the organisation shall be the coordination and unification of the petroleum policies of Member Countries and the determination of the best means for safeguarding their interests, individually and collectively”*
- B. *“The organisation shall devise ways and means of ensuring the stabilisation of prices in international oil markets with a view to eliminating harmful and unnecessary fluctuations”*
- C. *“Due regard shall be given at all times to the interests of the producing nations and to the necessity of securing a steady income to the producing countries; an efficient, economic and regular supply of petroleum to consuming nations; and a fair return on their capital to those investing in the petroleum industry”* (opec.org, 2015).

Since the 1970 oil price shock the behaviour of OPEC and its capability to wield market power over the world oil markets continues to be one of the least understood circumstances in modern economic history (Learsy, 2007). Over the years, OPEC has been a succession of cartels, each somehow different in structure and program and almost all members have participated in the output cuts, as well as mostly observed them (Adelman, 2002).

The oil market is the peak of the cartel’s principal strategy over the years: prudently raising the impression that the oil supply is incredible vulnerable and that any damage to the pipelines can be catastrophe to the industry; capable of bringing the industrial world to its knees (Learsy, 2007). OPEC exerts market power in the oil market by relying on production quotas to maintain the oil price in a prearranged constricted range (Learsy, 2007). From 1973 to 2001, OPEC intentionally cut output or refused to increase output in order to increase oil price, even though, during this period there was excess OPEC capacity (Adelman, 2002).

Towards the end of the last millennium, surplus supply and weak prices once again forced OPEC to act together (Horan, J.H, & J, 2004). The prices of oil once again fell as non-OPEC production increased a bit (Adelman, 2002) and the East Asian financial crisis of 1997 drastically reduced consumption in many Asian countries (Radelet & Sachs, 1998).

In order to increase the price of oil, OPEC members with the support of Norway and Mexico, successfully cut output by a little margin in March 1999 (Adelman, 2002).

2.6.3 OPEC Announcements

The OPEC meeting is the gathering of the Conference to discuss oil market situation. The Conference is the highest authority of the organisation and is made up of national delegates usually oil or energy ministers from member states. The Conference holds at least two meetings every year (Lin & Tamvakis, 2009). However, particular markets circumstances can lead to extraordinary meetings, e.g., six meetings were held in 1986, the year following the drastic oil price collapse shock (Franz & Azra, 2004). Among the many issues that are discussed at the meetings, the most important to oil markets are “market reviews” and ensuing “decisions on quota adjustment” (Lin & Tamvakis, 2009). The first press meeting generally indicates the tone of the conference which in turn generally triggers market speculation (Lin & Tamvakis, 2009). The most significant press releases are usually at the end, when member states officially publicise any decisions to regulate production allocations-whether production will be increased or decreased, or leave them unchanged (Franz & Azra, 2004). As the OPEC meeting dates are adequately made known to the public, expectations of quotas changes may vary just before and during meetings but usually settle down after the pronouncement of quota decision (Horan, J.H, & J, 2004).

2.7 Recent Oil Price

The price of oil has crumbled after years of stability. The oil benchmarks Brent crude and US WTI oil have both fallen 70% to \$29.43 and 71.8% to \$29.52 respectively (BBC News: January, 2016).

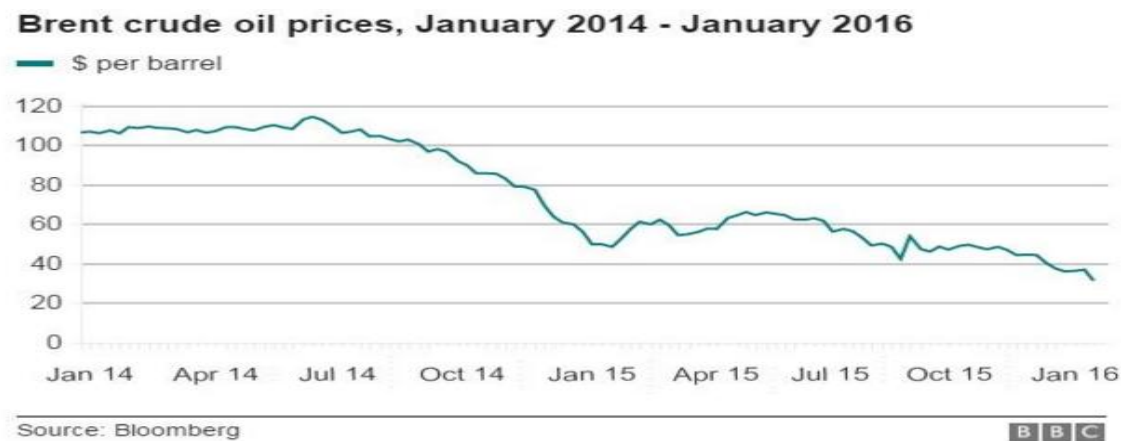


Table 1: Brent crude oil prices, January 2014 - January 2016

Analysts believe it will take years before oil returns to \$90 or \$100 a barrel, a price that was the standard for so many years (New York Times, 2016).

2.7.1 Why is the oil price so low?

The oil prices have tumbled by almost 70% in the last one and half years as supply far exceeds demand (BBC News: January, 2016). There are many factors responsible for the continuous fall in the prices of oil. The European economic slowdown as well as the recent slow growth in China and other emerging economies meant demand was not growing as anticipated (Amorim, 2015). Supply elements have played a significant part than the demand elements in reducing the oil price by fifty percent between June of 2014 and early 2015 (Aasim, et al., 2015).

The 1980s marked what analysts called the Chinese economic take-off as the country enjoyed continuous, fast-paced economic growth and development which can be likened to the boom era enjoyed by some European countries in the late 1990s and early 2000. However, China has been faced with slow economic growth in recent time.

Analysts forecast that Chinese economic growth will be faced by slow growth for the next fifteen years as a result of its aging population and its diversion from being exports oriented to a full-grown consumer market (Leach, 2015). The aging population has resulted to lower productivity which is having an adverse effect on the overall Chinese economy (Leach, 2015). This reduced the Chinese demand for oil.

On the other hand, supply from Non-OPEC countries has increased relatively as a result of the rise of US shale oil (Amorim, 2015). In recent years there has been significant growth of US shale oil (a process where oil is extracted from rock through fracking) and oil sands in Canada (Mirza, 2014). This phenomenon has had a dramatic bearing on the global oil market – as oil gradually start to flow from West to East rather than the other way (Ahmed, 2015).

The world biggest exporter of oil, Saudi Arabia, has failed to bow down to pressure from other OPEC members to cut down production – a strategy the organisation has previous implemented to inflate oil prices in the past (BBC News: January, 2016). Generally, when oil prices plunged, Saudi and other OPEC members would intervene by reducing production quota and allowing the prices to increase. However, the case is a little bit different this time as the tumble in oil price is as a result of the considerable growth in US energy output. Experts estimate that supply of oil outweighs its demand by about one million barrels of oil every single day (Ahmed, 2015). Saudi Arabia is determined to keep production levels at the current level with the sole main of reasserting its dominance in the oil market against the U.S companies which it sees as its new rivals in the energy market (theguardian , 2015).

The nuclear agreement deal reached between the Iran and the G5+1 Group of world powers; the U.S, UK, France, China, and Russia plus Germany saw international sanctions against Iran lifted (BBC News: January, 2016). Even though, the surplus oil supply had been impending for some period of time, the nuclear deal agreement reached will further compound the woes that have besieged oil market (BBC News: January, 2016). The coming back of Iran to the global oil market, with its official asserting that the country is able to produce and export half a million barrels a day, will be catastrophic to the already oversupply oil market which has made prices to plummeted to below \$30.00, a situation that has not been seen in twelve years period (Financial Times: January, 2016).

2.7.2 Impacts of the fall in oil prices

Oil prices have declined drastically over the past a year and half, resulting in substantial revenue losses in many oil exporting countries. On the other hand, consumers in many importing countries are likely to see a fall in their expenses as the price of oil falls in their countries (New York Times, 2016). The Large oil consuming countries such as the United States, Japan, South Korea, China and Europe are expected to benefit the most in the oil price falls (Amorim, 2015). There is an enormous amount of wealth transferred by a lower oil price. The U.S Federal Reserve estimated that around USD670 billion worth of wealth is transferred from oil producing countries to oil consuming countries for every drop of USD20 per barrel in the oil price (Amorim, 2015).

In general, the swift and degree of the oil price drop is likely to cause financial pressures, which could erode the overall benefits of lower oil prices, even though the impacts have so far been confined mainly to the oil producing countries especially the ones that requires high oil price to balance their budgets (Aasim, et al., 2015).

2.7.2.1 Who benefits?

The cost of gasoline and other domestic energy products inflate at a rocket speed whenever the oil price rises. On the other hand, the perception is that they simply drift down little by little like a feather when the world oil price collapses providing a good platform for suppliers to reap most of the benefits (BBC News: January, 2016).

These discussions on whether householders, motorists, and tourists are benefiting have been regenerated as a result of the falling in oil prices. Consumers and some businesses have benefitted from lower oil prices. UK motorists have seen the price of petrol and diesel fall from about £1.40 a litre 18 months ago to about £1 now. The transport operators and airlines should also be benefitting from cheaper fuel. The lower fuel costs have also helped to keep inflation close to zero in many countries (BBC News: January, 2016).

2.7.2.2 Who suffers?

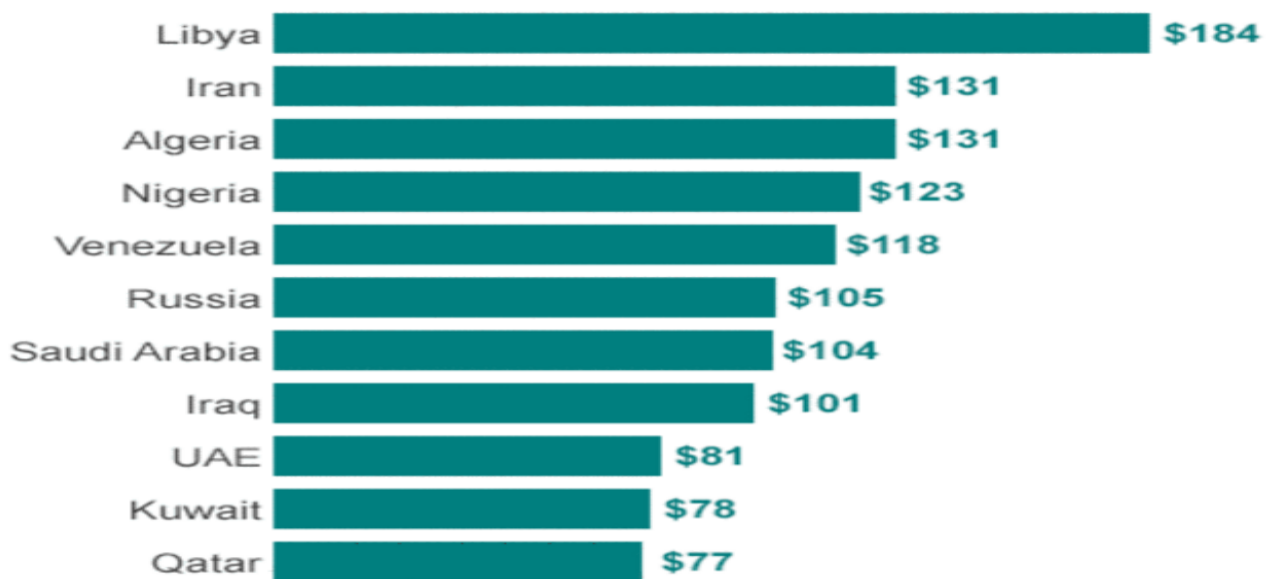
Oil exporting nations that rely on a higher oil price to break even are suffering, such as Russia, Nigeria and Venezuela, as are oil firms generally. Quite a number of companies have gone bankrupt and around 250,000 jobs in the oil industry have been lost (New York Times, 2016). Investment in exploration has been cut by big oil firms such as Shell, BP, Total and Exxon Mobile. Russia which generates about 70% of its revenue from oil and gas has been badly hit by the oil price tumble. The country loses around \$2bn in revenue each time the oil price fall by one dollar (BBC News: January, 2016).

Saudi Arabia, OPEC most powerful member is also getting a sting of the oil price downturn. Although, the country could cut down production in order to support the world oil prices, yet, there are no indications that the country is willing to do so (BBC News: January, 2016). Two reasons have been given for this stance by the Saudis – first to inculcate some level of discipline in the organisation and second to put some pressure on the US's flourishing shale oil industry (BBC News: January, 2016). The continuous fall in the world oil price is having much adverse impact on the Saudi economy at the moment due to the fact that the country has about \$700bn reserve fund in its sovereign wealth fund - which will enable the country to hold out against the fall in oil prices for some time (BBC News: January, 2016).

2.7.2.3 OPEC: Not all are equal

The impacts of the world oil price downturn have not been even among the OPEC members' countries. Most of the Gulf oil producing countries such as UAE and Kuwait alongside Saudi Arabia has accumulated substantial foreign currency reserves, which could hedge them against deficit for quite a number of years if needed. The likes of Iran, Nigeria and Iraq with higher national economic demand due to their bigger population proportions in comparison to their oil revenues, have less chance for manoeuvre (BBC News: January, 2016).

Oil price needed to balance budgets



Source: Deutsche Bank and IMF

Table 2: Oil needed to balance budgets by OPEC member states

Nigeria which is the second biggest economy in Africa and the continent's largest oil producer has also had its own fair share in the suffering. Although the country has seen rapid growth and development in recent years, it is still heavily depended on crude oil. Around 80% of the government revenue comes from oil and 90% of its export is oil related (BBC News: January, 2016). The country has faced serious budget deficits amounting to \$11bn since oil price fell to bottom level of \$36 per barrel in 2015. The unemployment rate has risen from 8.2% in 2014 to 9.9% by the end of 2015. Inflation has also gone up hitting 9.4% in September 2015. This has resulted to higher food prices in the country (BBC News, 2015).

2.8 Conclusion

This chapter reviewed the existing literature on the study. The structure of OPEC as well as the announcements of OPEC was examined in details. Also, the recent fall in oil prices was considered. However, the previous studies did not consider the recent fall in oil prices or take into account market expectations in their analyses.

The next chapter provides the data methodology that forms the basis of this research. The gap that existed in the previous studies will be examined.

Chapter Three Research Methodology

3.1 Introduction

In this chapter, the author intends to give the reader an understanding of the research methodology that forms the basis of this study. First, section 3.2 gives a summary of the current literature gap as well as the research questions and objectives. Session 3.3 examines the event study methodology, while section 3.4 provides the justification for both the event and estimation window. Sections 3.5 and 3.6 consider the testing protocol, sample selection and size process respectively. Sections 3.7 and 3.8 shed light on the data description and data cleaning. Sections 3.9 and 3.10 expound on the market expectations and the extreme drop in oil prices around two OPEC meetings. Sections 3.11 and 3.12 elaborate on other methodological decisions made during the course of this research and the limitations of this study. Section 3.13 provides a summary of the chapter.

3.2 Literature Gap, Research Questions and Objectives

3.2.1 Literature Gap

Previous studies on OPEC announcements covered the period when there was price stability in the oil market and a time when non-OPEC countries such as the US posed no major threats to OPEC. Moreover, none of the two categories of studies considered the impacts the lifting of international sanctions on Iran; another major oil producing country will have on OPEC influence on the oil market.

Lin & Tamvakis (2009), Schmidbauer & Rosch, (2009) studies were done when oil was selling for \$80.00 per barrel and OPEC had no major competitor in the oil market. Loderer (1985), Gulen (1996), and Alhajji & Huettner (2000) considered whether OPEC is an efficient cartel at a time where international community sanctions were imposed on Iran.

This study aims to fill these gaps by examining the impacts of OPEC Conferences announcements on oil prices during a period of high volatility in the oil market, an age where non-OPEC countries such as the U.S has become a major player, and an era that has witnessed the lifting of international sanctions on Iran, another major oil producing country. In addition, the author intends to introduce the expectations of the market prior to the OPEC announcements in the analysis as no previous work has been identified that has considered this enhancement.

3.2.2 Research Question and Research Objectives

After the analysis of both theoretical and empirical literature the ensuing research question has been founded by the author;

What is the impact of the OPEC Conferences' announcements on the world oil prices?

The research question is not to examine the role of OPEC in an economics framework and if the organisation exercises any kind of anticompetitive, oligopolistic or any other sort of market influences. Instead the objective of this research paper is to examine OPEC mainly as a basis of news, that may influence supply-side principles and, thereby, oil prices.

In order to back up the above research question the subsequent objectives have been derived;

Objective 1: To examine oil price changes around OPEC announcements, taking into consideration the corresponding rate of oil prices at the period of the announcement.

Objective 2: To examine if the level of impact is subject to the type of decision announced.

Objective 3: To examine oil price changes around OPEC announcements taking into consideration prior market expectations and the corresponding level of oil prices at the period of the announcement.

3.2.2.1 Overview of the Research Objectives

Objective 1: To examine oil price changes around OPEC announcements, taking into consideration the corresponding rate of oil prices at the period of the announcement.

The researcher intends to examine if there is any change be it a fall, a rise, or unchanged in the oil prices around the time of the OPEC Conference's announcements from 2005 to 2014. This will help to determine if the changes in oil prices around time of the OPEC announcements are as a result of the announcements or the changes are just in line with normal underlying movements.

Objective 2: To examine if the level of impact is subject to the type of decision announced.

This represents the main research objective upon which this research paper is based. The author aims to determine if OPEC Conferences announcements have any significant impacts on the world oil prices.

The author assumes that;

- There should be a positive (or negative) effect on oil price in the circumstance of a reduction (or increase) in production output decision (Lin & Tamvakis, 2009).
- The effect on volatility will be greater if OPEC decides to reduce or increase production output, than in the circumstance of leaving the production output unchanged, as the latter is not giving a different trade stimulus.

Objective 3: To examine oil price changes around OPEC announcements taking into consideration prior market expectations and the corresponding level of oil prices at the period of the announcement.

Objective three primarily aims to determine the influence of market expectations on the oil prices around time of the OPEC Conference announcements. The author anticipates that if the market expectation turns out to be in line with the announcements then then there won't be a great market shock on the oil price.

3.3 Event Study Literature

In this study the author uses the event study model to investigate the impact of OPEC announcements on oil prices. This approach has been widely used in many areas of financial economics and stock markets but to a lesser degree in the oil market. The event study method enables researchers to determine if the abnormal return of a firm is as a result of some certain events or happenings. More precisely, event studies attempt to determine the abnormal return that may occur during the course of the event that is under investigation by finding the variation between the actual return and the normal return in the absence of the event.

The most common platform used these days to test for the presence of abnormal stock market returns is laid down by the ground-breaking study of Fama, Fisher, Jensen, and Roll (1969) (Hogan, 1996). Their standard technique examines whether or not the random probability pattern behaviour of firms' market abnormal returns is substantially affected by some particular event such as an earnings announcement, CEO's death, or brokerage house endorsement (Hogan, 1996). However, MacKinlay (1999) believes that event study pioneering work started with the work of James Dolly in 1933, when he examined the price effects of 95 stock splits from 1921 to 1931. McWilliams, Siegel, & Toeh (1999) defined event study methodology as the process of examining or investigating the impact of an event on a specific dependent variable.

Announcement	Previous Studies Conducted
Quota Output Announcements	Lin & Tamvakis (2009)
Quota Output Announcements	Schmidbauer & Rosch (2009)
Quota Output Announcements	Draper 1984
Meetings	Russell & Tarbert (2006)
Meetings	Loderer (1985)

Table 3: Summary of previous event studies on OPEC

3.3.1 Event Study Procedure

Event study assesses the impact of an event on the wealth of a firm. According to Fama (1991) event study that span over one year period following an event can provide main evidence on market efficiency. The author chooses a 30-day estimation period (from 40 days to 11 days before the announcements) and a 20-day event window (from 10 days before to 10 days after the announcements). The event window is further sub-divided into four which are;

- 10 days before the announcements and 10 days after the announcements.
- 5 days before the announcements and 5 days after the announcements.
- 2 days before the announcement and 2 days after the announcements.
- 1 day before the announcements and 1 day after the announcements.

The purpose of the event window choice is to capture the impacts of OPEC Conference announcements and keep these impacts separate from that of previous and subsequent meetings. Following the approach employed by Lin & Tamvakis (2009), the author adopted the mean returns model to examine the impacts of OPEC announcements on world oil prices. The researcher expected that the abnormal returns from the event window under examination should be statistically insignificant provided OPEC announcements have no impact on oil prices. This methodology enables the researcher to analyse the impacts of OPEC announcements as a whole rather than individual announcements, which may be influenced by events happening during the event window period under examination. Any significant changes in the oil market such as seasonality and rationality are captured in the normal mean return of the data series.

3.3.2 Models for measuring Abnormal Returns

One obvious attribute of previous event studies is that various researchers have used different models developed under series of assumptions to determine the expected returns of stocks under analysis. Models such as Risk-Adjusted, Mean-Adjusted Model, Market-Adjusted Model, and Capital Assets Pricing Model are mostly used. Often, researchers adopt a particular model for the event being examined with or without elucidations. Nevertheless, in some instances, the condition may confine the use of some models.

For instance in the case of Initial public offerings (IPOs), some of these models cannot be used as the prices of the security before the event (IPOs) do not exist.

3.3.2.1 Mean-Adjusted Returns Model

This model assumes the expected return of an asset is equal to a constant. Abnormal return is simply the difference between the actual return and the predicted return which can either be negative or positive returns (Brav, Christopher, & Gompers, 2000). This model has been used by authors such as Avner and Loewenstein (1985) and Mackliney (1997). Following in the footsteps of Avner, Loewenstein and Mackliney, the researcher employed the mean adjusted model to calculate for the abnormal returns. The assessment of the announcement's bearing on oil prices can be calculated by the abnormal return (AR_t), which is denoted as follows;

$$AR_t = R_t - E(R_t)$$

Where R_t is the daily return on crude oil at the date (t) and E(R_t) is the normal return, which is the anticipated return at date t over a period other than the event window and without conditioning on announcement disclosure connected to the event. The expected return will be calculated based on the movement in oil price for a 30-day estimation period and 20-day event window.

3.3.2.2 Market-Adjusted Return Model

The primary assumption of this model is that the expected return of an asset is equivalent to the market returns (Draper D. W., 1984). This model simply examines the wide movements in the market during the event window. Subsequently, all the wide movements are removed from the returns when deriving the abnormal returns on and around the event. The major setback for this model is that it is only used in situations where the availability of data is limited.

3.3.2.3 Risk-Adjusted Return Model

Compare to the other two models discussed above, this model is more of a complex one as it incorporates both market wide movements and firm specific factors for each asset. This model compares the returns derived from an investment to the risks involved (Draper D. W., 1984).

3.4 Justification for the Event and Estimation Window

3.4.1 Event Window

The integration of the information, following the announcement, on oil prices may be instant or may take some period of time. Following Lin and Tamvakis (2009), the author choice of event window covers the period of ten days before the announcement and ten days after the announcement. The justification for this is that there are issues which have to be considered such as; information leakages before the OPEC announcements and to avoid overlapping with other OPEC meetings. The issue with a long event window is that there are too many other events that may influence the price, while a short event window is not long enough to for the price to fully reflect all the available information. The author's event window choice is also buttressed Wirl and Kujundzic (2004) who stated that the choice of ten days (or two trading weeks) prior and after the announcements is the most suitable of a variety of different event windows.

3.4.2 Estimation Window

Similarly, the choice of 30-day estimation period (from 40 days to 11 days before the announcements) is influenced by the gaps between OPEC Conference's meetings which are usually twice a year. However, in the event of extraordinary meetings, there can be up to five meetings a year as it was the case in 2005, 2006 and 2008. The author ran a check to make sure that the 40 days to 11 days estimation period does not overlap with any preceding or subsequent OPEC meetings.

3.5 Testing Protocols

At the completion of the secondary research, the author conducted statistical analysis with the sole aim of determining if the ARs over the specific event window were considerably different to zero, therefore ascertaining the impact of OPEC Conferences announcements on oil prices. During the course of examining the abnormal returns for all of the OPEC announcements, the author made use of Microsoft Excel 2010 to carry out statistical analyses.

3.6 Sample Selection Process & Size

3.6.1 Sample Selection Process

The author focuses on the OPEC Conference meetings that took place from 2005 to 2014. The dates of the OPEC Conferences meetings were obtained from the OPEC official press releases which are found on OPEC website. The author uses OPEC announcements days – when actual announcements took place, usually at the end of the conferences - as event day zero following Lin and Tamvakis, (2009).

3.6.2 Sample Size

Data from OPEC Conference meetings announcements from 2005 to 2014 is total of thirty-three meetings. In order to have a good data to work with, (MacCallum, Widaman, & Zhang, 1999) suggested that the sample size should cover a minimum of thirty observations. The author sample size of thirty-three is above the recommended minimum of thirty. This signifies that the sample is large enough to draw reliable and robust conclusion.

3.7 Data Description

The data is made up of daily WTI crude oil prices from 2005 - 2014 derived from the U.S EIA, as well as the dates, type, duration, and outcome of each of the OPEC Conference meetings derived from official documents and press releases published by OPEC.

3.8 Data Verification/Cleaning

To ensure that the subsequent results are not driven by some peculiarities of the data sets, the researcher undertakes some basic ‘data cleaning’. First, the researcher strip out the ‘weekends’ from oil prices for both the 30-day estimation period and the 20-day event window. This was done for the entire thirty-three OPEC Conference meetings one after the other. Second, the researcher checked the number of days between the meeting to determine if there is any overlapping in both the estimation and event periods. The average time between the thirty-four meetings is one hundred and twelve days. However, there were three meetings where the average time period was less than fifty days, which meant that the estimation period overlapped in those three meetings. In calculating the changes in normal price movement for those three periods, the author reduced the estimation window so that there is no overlap.

In addition, the researcher confirmed the accuracy of all the dates of the OPEC Conference meetings in the annual reports with the dates reported in various media outlets so as to have the right estimation and event periods covering each of the meetings.

3.9 Market Expectation on OPEC Announcements

Gathering data on the market expectations prior to the OPEC announcements was done via a search in reputable media outlets for news articles around the event as there is no central channel or platform where market expectations in regards to the OPEC meetings are clearly stated. The author went on ProQuest and looked at the historical reports in the Financial Times between fourteen days and one day prior to the announcements to get what the broad market expectations are around the time of the OPEC meetings. For instance days before the 138th OPEC meeting (12/12/2005), the market was expecting OPEC to increase its production quota. This was reported in the Financial Times on the 10/12/2005, under the headline *“OPEC to pump all it can despite falling price”*.

Appendix K displays the market expectations for all the thirty-three OPEC meetings examined in this study.

3.10 Extreme drop in the oil prices around 151st and 166th meetings

There was a large drop in the price of oil around these two meetings. When this unusual drop was noticed in the data, the author checked OPEC website to confirm the date recorded for the meeting was accurate before proceeding to confirm the date on media reporting. Afterwards, the oil prices around the two meetings were rechecked on the U.S EIA website which was also accurate. Thus, the researcher has confidence that the data is accurate. The 151st meeting took place on the 17th December, 2008. This was during the 2008 Financial Crisis. Around this period media reporting quoted the OPEC president Chakib Khelil saying that oil prices have fallen drastically in recent months as a result of the repercussions of the financial crisis and the organisation is in a very deteriorating environment. As the deepening economic recession sapped global oil demand, OPEC decided to cut production in the hope to stabilise the oil price which had fell more than \$100 a barrel since reaching a record high of \$147.27 a barrel in July of the same year (CNNMoney.com, 2008).

Similar to 151st meeting, 166th meeting which took place on the 27th November 2014, also witnessed significant drop in the oil prices. Some reasons have been put forward for the fall in oil prices. The increase in oil supply from non-OPEC countries such as the U.S and Canada and the slow growth in the Chinese economy are some of the reasons given (The Economist, 2014). This has been discussed in detail in the previous chapter.

3.11 Limitations

The use of the event study methodology has been on the increase in various academic fields to evaluate the impact of tactical decisions on firm performance (McWilliams, Siegel, & Teoh, 1999). However, one of the shortcomings of even study methodology is its sensitivity to small changes in research design (McWilliams, Siegel, & Teoh, 1999). The following obstacles have also been identified by the author;

- Sample size: the sample size of thirty-three meetings is just a little above the recommended thirty. It will be difficult to get information if one decides to go any further as the information becomes lesser and lesser.
- Media reporting: the media coverage around OPEC Conference meetings is variable. At some meetings there was very low media interest. This means that to determine the prior expectation is open to interpretation. Moreover, the capture of the market expectations is not a totally reliable process. The source the author used which is The Financial Times is UK centric, business friendly and Western focus. Therefore, its analyses and reports on OPEC, an organisation dominated by Middle East countries might be subject to some levels of bias.
- The timing of the OPEC announcement versus the oil price data the author collected from the U.S EIA is another limitation encountered. The author is unclear as to whether the spot price on the day of the announcement is a pre-meeting spot price or a post-meeting spot price. Therefore, the author used the oil prices one day (-1) before the announcement and one day (+1) after the announcement which he is certain of, while ignoring the price changes on the day of the announcement in the analysis as the certainty of its provenance is questionable.

4.12 Conclusions

In this chapter, the researcher gave a complete overview of the research methodology adopted in this study. Furthermore, the author elaborated on the research question and objectives as well as the related literature upon which this research is founded. Both the models utilised and the data gathering procedures adopted has been well detailed. The methodology and decisions utilised will lay the platform for the next chapter, which displays the findings of this study.

Chapter Four Findings

4.1 Introduction

The chapter presents the findings of the statistical analyses conducted with the aim of addressing the research question and the objectives of this study earlier. The chapter is laid out as follows; section 4.2 displays the nature and outcome of the thirty-three OPEC meetings. Section 4.3 shows the findings on the first objective of this study ‘to examine oil price changes around OPEC announcements. Section 5.4 presents the results on the second objective of this research ‘to examine if the level of impact is subject to the type of decision announced. Section 5.5 provides the outcomes on the third objective of this research ‘to examine oil price changes around OPEC announcements taking into consideration prior market expectations and the corresponding level of oil prices at the period of the announcement. Lastly, section 5.6 gives a summary of the chapter.

4.2 The Nature of OPEC meetings

There were a total of thirty-three meetings from 1st January 2005 to 31st December 2014. Each OPEC meeting usually lasts for about a week. The part of the meeting that draws the most media attention is towards the end when OPEC makes public its production quota. This is usually at the last day of meeting where a press conference is given and OPEC officials will state the decision of the organisation on its production target.

4.2.1 Outcome of OPEC Meetings

There are twenty-three production quota unchanged, six increases and four cuts in the thirty-three OPEC announcements.

OPEC Announcements		Change in Output (000,000) Barrels	% Change in Output
Unchange (n=23)	0	0	0%
Increase (n=6)	Average	1.583	6.08%
	Minimum	0.5	1.82%
	Maximum	5.2	20.97%
Decrease (n=4)	Average	1.625	5.71%
	Minimum	-0.5	-1.79%
	Maximum	-2.5	-9.16%

Table 4: OPEC Announcement on Production Output

Table 4 shows that at the end of each meeting OPEC in most cases does leave production level the same. However, there are few instances where the organisation has either increased or decreased production output. Towards the end of 2008, there was a 9.16% cut in the production output. The amount of crude oil been supplied into the oil market was well in excess of actual demand. Besides, the effect of the 2008 Financial Crisis has resulted into a destruction of demand, leading to unusual downhill burden being exerted on oil prices, which have fallen by more than US \$90 a barrel since early July 2008 (www.opec.org, 2008). However, by mid-2011, OPEC suddenly increased production by 20.97% and it has remained unchanged up till the period the researcher is covering. In 2011, the oil market witnessed high levels of volatility and an upward movement in oil prices (www.opec.org, 2011). The full data is shown in Appendix C.

4.3 Oil Price Reaction to OPEC meetings

How oil prices react to OPEC meetings will be examined in two ways. First, oil price reaction will be examined using the thirty-three OPEC meetings full sample. Then, oil price reaction will be observed after two outliers; 151st and 166th OPEC meetings have been removed. These meetings have been discussed in detail earlier.

4.3.1 Oil Price reaction to full OPEC meetings

The abnormal price is the difference between the actual price movement and the expected price movement. The expected price movement is derived by calculating the oil price movements for the estimation window. The average is the average of oil prices for all the thirty-three OPEC meetings over the specified window, ST DEV is the standard deviation for the thirty-three OPEC meetings over the specified window, while the P-value is the calculated probability that the average change in price is greater or less than zero for the thirty-three OPEC meetings over the specified window.

Table 5**Price Movements****Thirty-three OPEC Meetings**

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=33

OPEC Meetings	% Δ in Actual Price -1 +1	% Δ in Actual Price -2 +2	% Δ in Actual Price -5 +5	% Δ in Actual Price -10 +10
Average	-0.35%	-1.05%	-1.02%	-0.72%
ST DEV	4.39%	5.82%	7.84%	9.49%
P-value	0.65	0.31	0.46	0.67

OPEC Meetings	% Δ in Abnormal Price +1 -1	% Δ in Abnormal Price -2 +2	% Δ in Abnormal Price -5 +5	% Δ in Abnormal Price -10 +10
Average	-0.40%	-1.17%	-1.30%	-1.29%
ST DEV	3.99%	5.12%	6.92%	12.14%
P-value	0.57	0.2	0.91	0.55

If the P-value is less than 0.05 then one can state with 95% confidence that the average change in oil price across the event window (-1 +1, -2 +2, -5, +5, -10, +10) is greater (or less) than zero.

First, overall on average the prices of oil fell across the four event days (-1 +1, -2 +2, -5 +5, -10, +10) considered around OPEC meetings. However, looking at the P-value, the researcher found no significant results. This shows that when OPEC makes announcement it does not result to an average price increase or price decrease, rather price change is not different to zero. Nevertheless, there are many observations that are positive as well as negative when one examined the full data. It seems the oil price movements are random which indicates that OPEC does not have any impact on oil prices. The full data is displayed in Appendix F.

4.3.2 Treatment of outliers in this study

Out of the thirty-three meetings which make up the data from where the analyses are derived, two meetings can be considered outliers. The extraordinary events that happened around the time 151st and 166th meetings took place make their observation points distant from other observations. This has been discussed in the literature review and methodology chapters. The researcher is then faced with the dilemma whether to remove the two outliers from the data set or leave them in the data set. Ordinarily, it is expected to exclude the outliers from the data set and rerun the analysis. However, as the sample size of thirty three of this study is just barely above thirty that is recommended by MacCallum, Widaman and Zhang (1999), the researcher is of the opinion that it is best to include the outliers in the data set. Moreover, as part of the analysis in this study the observations are sub-divided into smaller sub samples. The impact of removing two observations may lead to very small sub-samples impacting on the robustness of the results and interpretations. On the other hand, leaving the outliers in the data set might have undue influence on the results. For instance, the average percentage change in the price movement -1 +1 when the outliers are included in the observations is - 0.35%, while it is 0.36% when the outliers are removed. Therefore, both sets of results are presented.

4.3.3 Oil price reaction without the presence of outliers

The removal of outliers 151st and the 166th OPEC meetings brings the number of observations to thirty-one.

Table 6

Price Movements

Thirty-one OPEC Meetings

NB: -1 +1 signifies a day before and a day after OPEC meeting, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. $N=31$

OPEC Meetings	% Δ Actual Price -1 +1	% Δ Actual Price -2 +2	% Δ in Actual Price -5 +5	% Δ in Actual Price -10 +10
Average	0.36%	0.01%	0.09%	-0.02%
ST DEV	3.22%	3.53%	6.53%	8.97%
P-value	0.54	0.99	0.94	0.99

OPEC Meetings	% Δ Abnormal Price +1 -1	% Δ Abnormal Price -2 +2	% Δ in Abnormal Price -5 +5	% Δ in Abnormal Price -10 +10
Average	0.17%	-0.36%	-0.85%	-1.89%
ST DEV	3.19%	3.77%	6.88%	11.28%
P-value	0.77	0.6	0.5	0.36

After the removal of the two outliers from the sample size, the overall average price change does not display any pattern as there are both positive and negative in the oil price movements. This follows the sample pattern when the outliers are included in the sample size. P-values show that the average change in oil price movements across the window is not different to zero. From this analysis, one can say that when OPEC makes announcement, it does not result to an average price increase or an average price decrease, rather price movement is just random. The full data is displayed in Appendix G.

4.4. Oil Price Reaction and Types of OPEC Decision

In the previous section, oil price reaction to all OPEC meetings was displayed. The researcher considered the oil reaction by examining the full sample as well as removing the outliers from the data set. In this section, the outcome of the meetings will be considered to determine whether there was any significant impact on oil price. The decision on production quota can be any of the three; unchanged, increase and cut. In most cases, OPEC leaves its production quota unchanged.

4.4.1 Oil Price Reaction when OPEC Decision is Unchanged

Most of the OPEC decisions on production quota at the end of each meeting are usually to leave production quota unchanged. There are twenty-two decisions to leave the production allocation the same out of the thirty-three decisions made by OPEC.

Table 7

Price Movements

No Change in Production Quota

NB: *-1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=22*

OPEC Meetings	% Δ in Actual Price -1 +1	% Δ in Actual Price -2 +2	% Δ in Actual Price -5 +5	% Δ in Actual Price -10 +10
Average	0.00%	-0.21%	0.88%	0.12%
ST DEV	3.33%	3.77%	6.41%	9.84%
P-value	0.58	0.80%	0.53%	0.95%

OPEC Meetings	% Δ in Abnormal Price +1 -1	% Δ in Abnormal Price -2 +2	% Δ in Abnormal Price +5 -5	% Δ in Abnormal Price -10 +10
Average	-0.32%	-0.86%	-0.74%	-3.11%
ST DEV	3.29%	3.96%	6.60%	12.17%
P-value	0.65	0.32	0.60	0.24

When OPEC's decision was to leave the oil production quota unchanged, the average price reaction is mostly negative. The average of actual oil prices for the event days (-1 +1, -2 +2, -5 +5, -10 +10) are mostly positive, while the average for the abnormal prices/returns are all negative. The P-value for the event window is greater than 0.05.

This shows that the average change in oil price is not significantly different to zero when OPEC announces to leave its production quota unchanged. The full data is shown in Appendix H.

4.4.2 Oil Price Reaction when OPEC Decision is Increase

OPEC made ten decisions to increase its oil production quota out of the total thirty-three decisions taken. It is worth noting that the sample size is very small at seven. Unlike when OPEC decides to leave its oil production quota unchanged, the overall average price leans toward positive when OPEC decides to increase oil production quota. Ordinarily, one won't expect an increase in supply to result into price increase.

Table 8

Price Movements

Increase in Production Quota

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=6

OPEC Meetings	% Δ in Actual Price -1 +1	% Δ in Actual Price -2 +2	% Δ in Actual Price -5 +5	% Δ in Actual Price -10 +10
Average	1.99%	1.47%	-1.82%	1.90%
ST DEV	2.08%	3.73%	9.35%	7.41%
P-value	0.07	0.38	0.65	0.56
OPEC Meetings	% Δ in Abnormal Price +1 -1	% Δ in Abnormal Price -2 +2	% Δ in Abnormal Price +5 -5	% Δ in Abnormal Price -10 +10
Average	2.69%	2.22%	1.65%	5.66%
ST DEV	1.07%	2.77%	8.64%	5.25%
P-value	0.00	0.11	0.66	0.05

The averages of the actual price of oil and abnormal returns/price for the event window are all positive except for average actual price for event day -5 +5. One can deduce that there is a positive relationship between the oil price and OPEC decision to increase production quota. It is of note that the average increase in both actual price and abnormal price when OPEC increase supply for the various event days is low. The only increase that is above 5% is the abnormal price for the event day -10 +10. Surprisingly, when OPEC decides to increase its production allocation there is a significant price increase in the event window. Event days -1 +1 and -10 +10 have P-value 0.00 and 0.05 respectively. One can say with 95% confidence that the average change in oil price in the two event window (-1 +1 and -10 +10) is greater (or less) than zero indicating that OPEC has some impact on oil prices. The full table is presented in Appendix I.

4.4.3 Oil Price reaction when OPEC Decision is Decrease

On four occasions OPEC cut its oil production quota out of the thirty-three decisions on production allocation. This suggests that the organisation is reluctant to cut the amount of its oil supply to the market and is more inclined to leave its oil production quota unchanged most of the time or at least increase it. This is not surprising as OPEC member-states are more motivated to increase supply their oil supply in order to generate more revenue. Besides, it is more difficult of the OPEC to enforce a cut among its member states. It is of note that the number of observations is considerably very small at four samples.

Table 9

Price Movements

Decrease in Production Quota

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. $N=4$

OPEC Meetings	% Δ in Actual Price -1 +1	% Δ in Actual Price -2 +2	% Δ in Actual Price -5 +5	% Δ in Actual Price -10 +10
Average	-5.81%	-8.83%	-8.84%	-9.01%
ST DEV	8.31%	11.86%	10.07%	8.94%
P-value	0.26	0.23	0.18	0.14
OPEC Meetings	% Δ in Abnormal Price +1 -1	% Δ in Abnormal Price -2 +2	% Δ in Abnormal Price +5 -5	% Δ in Abnormal Price -10 +10
Average	-4.94%	-6.91%	-4.54%	-0.40%
ST DEV	6.77%	9.15%	5.93%	18.93%
P-value	0.24	0.23	0.22	0.97

When OPEC announces a production cut, there is an average fall in the prices of oil across the event window. This indicates that there is a negative relationship between oil price and OPEC announcement to cut oil production quota.

However, the P-value shows that the fall in oil prices is not significantly different to zero. This indicates that OPEC announcements have no impact on oil prices when the organisation decides to cut production quota. It is worth mentioning that there is considerable fall in oil prices on the average around the event days except on abnormal price on the event day -10 +10. The full table is shown in Appendix J.

4.5 Market Expectations

The earlier segment examined impact of OPEC decision on oil prices. This subdivision will introduce the prior expectation of the market. Prior to OPEC announcements there are always speculations on what decision the organisation will take on production quota at the end of its meeting. The researcher speculates that if the market guesses what decision OPEC will take correctly, there won't be much shock in the oil market to influence the oil price in favour of the organisation and if the market expectation is wrong then there should be a considerable shock in the oil market that might influence the oil price in favour of OPEC.

4.5.1 Summary of Market Expectations

OPEC made thirty three decisions on production quotas for the ten year period covered in this study. The market was able to predict twenty-three OPEC decisions correctly, leaving ten predictions wrong. The ability of the market to predict correctly is better than random. Detailed market expectations can be found in Appendix K.

4.5.2 When Market Expectation is Correct

On most occasions the market is able to predict correctly what decision OPEC is going to take on its oil production quota. The researcher examines the oil price reaction when the market gets its prediction right into two ways; first, with the presence of outlier, and second with the removal of outlier. The researcher finds that the result is the same for both. The average change in price is mostly negative for the event window.

Table 10

Price Movements

When Market Expectation is Correct

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=23

OPEC Announcements	% Δ in Actual price -1 +1	% Δ in Actual price -2 +2	% Δ in Actual price -5 +5	% Δ in Actual price -10 +10
Average	-0.56%	-1.33%	-1.74%	-0.83%
ST DEV	4.78%	6.17%	7.75%	8.40%
P-value	0.58	0.31	0.29	0.64

OPEC Announcements	% Δ in Abnormal price -1 +1	% Δ in Abnormal price -2 +2	% Δ in Abnormal price -5 +5	% Δ in Abnormal price -10 +10
Average	-0.73%	-1.38%	-1.86%	-1.06%
ST DEV	4.65%	5.39%	7.27%	12.50%
P-value	0.46	0.23	0.23	0.69

However, the P-value indicates that average fall in oil prices when the market correctly predict what decision OPEC is going to take on its production allocation at the end of its meeting is not significantly different to zero.

This coincides with the researcher expectation that there should not be any significant change in the oil price reaction if the market is able to correctly predict OPEC decision on oil production quota. Full table is displayed in Appendix M.

4.5.3 When Market Expectation is Correct without the Presence of Outliers

The number of observations has fallen to 22 after the removal of the outlier meeting 151st from the data set. There is a general fall in the average price for the entire event window except for event day -1 +1. This signifies that there is a negative relationship between oil price and when market expectation is correct.

Table 11**Price Movements****When Market Expectation is Correct**

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=22

OPEC Announcements	% Δ in Actual price -1 +1	% Δ in Actual price -2 +2	% Δ in Actual price -5 +5	% Δ in Actual price -10 +10
Average	0.15%	-0.22%	-0.74%	-0.81%
ST DEV	3.42%	3.23%	6.26%	8.60%
P-value	0.84	0.75	0.59	0.66
OPEC Announcements	% Δ in Abnormal price -1 +1	% Δ in Abnormal price -2 +2	% Δ in Abnormal price -5 +5	% Δ in Abnormal price -10 +10
Average	-0.16%	-0.53%	-1.52%	-2.33%
ST DEV	3.83%	3.62%	7.25%	11.16%
P-value	0.85	0.5	0.34	0.34

However, a quick look at the P-value shows that when market correctly guesses OPEC's decision on production allocation, it does not result to an average increase or (decrease) in price, rather price change is not different to zero. Full table is shown in Appendix N.

4.5.4 When Market Expectation is Incorrect

On ten occasions the market gets OPEC decision on production quotas wrong. The number of observations is quite small at ten. The observations become nine when the outlier has been removed. The researcher anticipates that there should be a significant impact on the oil price (increase) if the market wrongly predicts OPEC decision. On average, the price reactions for the event days are random. While there is increase in the oil price for event window -1 +1 and -5 +5, there seems to be decrease in the oil price for event window -2 +2 and -10 +10. Looking at the full sample set shows that there is a random movement in the oil prices around these event days.

Table 12

Price Movements

When Market Expectation is Incorrect

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC meeting, while -10 +10 signifies ten days before and ten days after OPEC announcement. $N=10$

OPEC Announcements	% Δ in Actual price -1 +1	% Δ in Actual price -2 +2	% Δ in Actual price -5 +5	% Δ in Actual price -10 +10
Average	0.14%	-0.42%	0.63%	-0.47%
ST DEV	0.04%	0.05%	0.08%	0.12%
P-value	1.53E-06	7.34E-10	1.30E-09	5.88E-07

OPEC Announcements	% Δ in Abnormal price -1 +1	% Δ in Abnormal price -2 +2	% Δ in Abnormal price -5 +5	% Δ in Abnormal price -10 +10
Average	0.01%	-0.69%	-0.02%	-1.77%
ST DEV	0.03%	0.05%	0.06%	0.12%
P-value	0.32	8.70E-12	0.32	4.79E-12

However, the P-value indicates a significant impact on price across most of the event window when market wrongly guesses what OPEC decision on production allocation will be. With this result, the researcher can state with 95% confidence that the average change in oil prices across the event window is greater (or less) than zero whenever market wrongly guess OPEC decisions on production quotas. Full data is displayed in Appendix O.

4.5.5 When Market Expectation is Incorrect without the Presence of Outlier

The removal of the outlier from the sample set alter the earlier result found on market expectation. Although, there is still a random movement in the oil prices, however, the researcher found no significant results as the price change is not different to zero across the event window.

Table 13
Price Movements
When Market Expectation is Incorrect

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=9

OPEC Announcements	% Δ in Actual price -1 +1	% Δ in Actual price -2 +2	% Δ in Actual price -5 +5	% Δ in Actual price -10 +10
Average	0.87%	0.59%	2.13%	1.92%
ST DEV	2.80%	4.35%	7.10%	10.07%
P-value	0.38	0.69	0.39	0.58

OPEC Announcements	% Δ in Abnormal price -1 +1	% Δ in Abnormal price -2 +2	% Δ in Abnormal price -5 +5	% Δ in Abnormal price -10 +10
Average	0.60%	0.05%	0.79%	-0.76%
ST DEV	2.46%	4.31%	5.98%	12.14%
P-value	0.49	0.74	0.7	0.86

The finding is different from the earlier finding when outlier is included in the data set.

Full data is displayed in Appendix P.

4.5.6 T-Test for Market Expectations

As explained earlier in this chapter, the market often predicts OPEC decisions correctly. However, there have been few cases where the market expectation of OPEC decision was wrong. The t-test is to compare whether the correct market expectation have different average values to the wrong market expectation. This will determine whether the difference is perhaps representative of a real difference between correct market expectation and wrong market expectation or whether that is most likely a meaningless statistical coincidence. Therefore, if the t-test for the event window is greater than 0.05 then the difference is statistically insignificant.

Table 14
Correct & Incorrect Market Expectations

T-test

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=33

	% Δ in Actual Price -1 +1		% Δ in Actual Price -2 +2		% Δ in Actual Price -5 +5		% Δ in Actual Price -10 +10	
	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
T-TEST		0.64		0.67		0.45		0.93
	% Δ in Abnormal Price -1 +1		% Δ in Abnormal Price -2 +2		% Δ in Abnormal Price -5 +5		% Δ in Abnormal Price -10 +10	
	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
T-TEST		0.59		0.71		0.47		0.88

The t-test is greater than 0.05 throughout the event window. This signifies there is no difference between the average values of when market expectation is correct and the average values when market expectation is wrong. This might be due to small sample size. Full data is shown in Appendix Q.

4.6 Conclusion

This chapter highlighted the findings of this study. Whilst the findings were generally in agreement with similar studies into the impact of OPEC announcements on oil prices, the researcher found some evidence that OPEC announcements do impact oil price when the market expectations are wrong. The findings will create the platform for the next chapter, which elaborates the results for three research objectives earlier stated in this study.

Chapter Five Discussions

5.1 Introduction

In this chapter the researcher amalgamate the research findings in Chapter four with the literature reviewed in Chapter two and consider the implications of these findings. The Chapter is laid out thus; section 5.2 provides a synopsis of the previous literature review, section 5.3 discusses the findings in relation to changes in oil prices around OPEC announcements. Section 5.4 expounds the findings of the impact of OPEC announcements on oil price in conjunction to the type of decision announced. Section 5.5 elaborates the findings of oil price changes around OPEC announcements taking into consideration prior market expectations. Section 5.6 discusses the diminishing influence of OPEC. Section 5.7 gives a summary of explanations.

5.2 Summary of Previous Studies

Over the years, quite a number of studies have been carried out on the impact of OPEC announcements on oil prices as well as the efficiency of the organisation as a cartel. Xiaowen and Timvakis (2009) found differences in the degree and significance of market reaction to OPEC quota decisions under different price bands. In his journal article, Loderer (1985) found mixed evidence that OPEC is influencing oil prices. However, Aljajji and Huettnner (2000), after studying OPEC behaviour models found no definite proof of any significant indication that OPEC can be classified as a dominant player in the oil markets. On the other hand, Horan et al. (2004) studied the implied volatility of crude oil options and found that OPEC has a significant effect on oil price.

5.3 Oil Price Reaction to OPEC Meetings

The first research objective of this study is to examine oil price changes around OPEC announcements, taking into consideration the responding rate of oil prices at the time of announcement.

The analysis of the full data set reveals a negative relationship between oil price and OPEC announcements on average for the event window covered. Nonetheless, the study found no significant result that OPEC influence price through its announcements.

Similarly, the result is the same when oil price reaction is examined after the removal of outliers. Although, there is an increase in oil prices for most of the event window except (-10 +10). However, it does not result to an average price increase or an average price decrease as price change is not different to zero. A closer look at the full data set shows that oil price movements around OPEC announcements are random. These results are different to the studies of Horan et al. (2004) who established that OPEC has a significant influence on oil price, but aligns with Alhajji and Huettner (2000) findings of ineffectiveness of OPEC as a cartel.

It is expected that an organisation that produces about 40% of the world's crude oil and its exports amount to nearly 60% on the global market should have significant influence on the oil price. The results of this study found no strong evidence that OPEC has any significant impact on oil price. The reasons for this could be; first, oil price is relatively determined by actual supply and demand, and fairly by market expectation (Economist, 2014). Second, oil market is extremely volatile most often associated to factors such as; weather, government policies, political situations in the Middle East, and the global economy (Time, 2008). A lot of these factors are beyond the control of OPEC. Furthermore, OPEC does not have a far reaching arm of control over the demand cycle even though the organisation seems to have good control of the supply size of the oil market. This is in line with what several studies have already established that demand and supply which play significant role in price determination cannot be controlled by the same party.

5.4 Oil Reaction and Type of OPEC Decision

The second research objective of this study is to examine if the level of impact is subject to the type of decision announced.

5.4.1 No Change in Production Quota

When there is no change in production quotas, the price is not significantly different from zero and the average returns for the event window are negative. This finding is in line with the findings of Xiaowen and Timvakis (2009) who found that no change in quotas seem to result in negative or insignificant returns. Based on these findings, one would expect OPEC to either increase or decrease its oil production quotas. However, the researcher noted that since early 2009, OPEC has mostly leaves its production quotas unchanged. Even, when oil price crashed at the end of 2014, OPEC still refuses to cut its quotas. One possible reason could be due to the fact that the oil prices have been considerable high and stable for some period before it started to decline towards the end of 2014 (Economist, 2014). Another reason could be to flood the oil market so that it will be very difficult for OPEC competitors especially the U.S to break even at a very low price due to its more expensive oil fracking.

5.4.2 Increase in Production Quotas

When OPEC increases quotas, there is a positive return as oil prices increases on the average. The increase in price is different to zero especially for event period (-1 +1 and -10 +10). The results are different from the findings of Xiaowen and Timvakis (2009), who found negative returns when OPEC increases quotas. The disparity in the results is most likely to be due to sample size. Xiaowen and Timvakis (2009) used a sample size of 202 in their production increase decision compared to a sample size of six used in this study. With a small sample size, one or two usual outcome can have a big bearing on the result.

5.4.3 Cut in Production Quotas

The negative relationship that exists between oil prices and OPEC decision to cut quotas detailed in Chapter four is in line with the findings of Xiaowen and Timvakis (2009) who found returns to be negative around the announcement day. Ordinarily, one would expect that a cut in production quotas to send the price oil high. However, due to lack of cohesion in the cartel (Financial Times, 2014), the market believe that OPEC is unable to impose the stated quota cuts on members. Another reason could be that the market has fully reflects all the available information pertaining to the OPEC decision to cut oil production quota suggesting that the oil market is efficient.

5.5 Market Expectations

The third objective is to examine oil price changes around OPEC announcements, taking into consideration prior market expectations. Most often the market is able to predict correctly what OPEC decision will be at the end of each meeting.

5.5.1 When the market got it right

The findings indicate a negative reaction to price around OPEC announcements. Nevertheless, the negative change in price is no different to zero. This indicates that OPEC announcements do not have any impact on oil price. The findings in line with the works of Aljajji and Huettner (2000), who found no definite proof of any significant indication that OPEC can influence price.

It is an extraordinary result for the market to be able to correctly predict twenty-three results correctly out of the thirty-three OPEC decisions. According to a p-value calculator two tailed, the probability of getting twenty-two heads in thirty-three coin tosses is 1 percent. However, the market predictions were not done in information vacuum as OPEC do give hints on what decision it is going to make days before the meeting comes to an end. This can be called ‘expected leaks’. For instance, the Saudis do give a press conference on what decision they are taking on production quota even before the commencement of the meeting.

5.5.2 When the market got it wrong

From the table in the previous Chapter, there is clear evidence that the impact of OPEC announcements on oil price is significant when market expectation is wrong in a number of cases. This result is consistent with the findings of Horan et al. (2004) that OPEC has a significant impact on oil price. However, a different result emerges when the outliers are removed. OPEC announcements have no impact on price and the overall average price change does not display any pattern as there are both positive and negative in the oil price movements. The reason for the difference in result is mostly that the presence of outliers skewed the outcome of the analysis.

The market can make wrong predictions in two ways. The first is to predict a higher or a lower production quota than the actual OPEC production quota. The second way has to do with by what margin (which can be either one or two) does the market gets it wrong. By margin the researcher means that when the market expects OPEC to increase production but OPEC leaves production unchanged then the market is wrong by one margin. However, if the market expects OPEC to increase production but OPEC decided to decrease production then the market is wrong by two margins. Out of ten wrong expectations, the market predicted five cases higher than the actual quota and five cases lower than the actual outcome. Most importantly only one case is out by two margins which is the 149th meeting, the remaining nine are out by one margin. This indicates that the market is close to getting those wrong predictions right.

5.5.3 The Source of Market Expectations

To determine the market expectations, the researcher examined series of news articles to the run-up of OPEC meetings. News reporting and financial analysts' commentaries on the oil market from fourteen days to a day before the commencement of the OPEC meetings were looked at. The two media outlets used to source for the market expectations are The FT and the BBC. Both media outlets are Western centric which means that their market analysis of the global oil market is seen majorly from consumers' perspective as most Western society is oil consuming.

There might be some level of subjectivity in their analysis of the global industry as OPEC is dominated by countries from the Middle East. The presence of subjectivity in the reporting of the Western news media can be removed by getting the market expectations from the Middle East and then comparing it to the ones from the FT and the BBC. However, it is impossible for the researcher to get what the market expectations are by reading the leading financial journal articles in from the Middle East as they are written in Arabia, a language the researcher does not understand. Nevertheless, about two-third of market predictions is correct.

5.6 The Diminishing Influence of OPEC

For decades, there have been talks on whether OPEC is able to keep up its share of world oil production. Over the last few years, OPEC's share of the global oil production has dropped due to increasing in oil production coming from the U.S and Canada. Moreover, the refusal of the cartel to cut oil supply in order to maintain its market share against the U.S higher-cost competitor when the price of oil crashed in late 2014 backfired. The strategy which was led by the Saudis and its Gulf allies has caused division among the OPEC members with about half of the members against the Saudi stance.

5.6.1 OPEC Indiscipline and Lack of Mechanism of Sanction

One of the major factors that are eroding OPEC dominance in the global oil market is the indiscipline that exists in the cartel. OPEC's dominance is strengthened by its policy of supply restriction. However, there are always incentives for the members of the organisation to cheat by supplying more barrels of oil than the agreed quota which erodes the power of the cartel, thus exposing it to a prisoner's dilemma where member states disregard the agreed quota and embrace their own individual production quota. When assessing the level of accomplishments in the previous application of OPEC's policies or even considering the upcoming policy actions, one must keep in mind that the body's production ceiling is exposed to the danger of "free-rider" attitude (Smith, 2005).

Non-compliance to regulations and the incentive to surpass the agreed quota by OPEC countries is as a result of lack of disciplinary measures that exist in the organisation. Griffin and Nielson (1994) proposed that Saudi Arabia play an important part in penalising and compensating member states through a tit-for-tat approach. Nevertheless, since the initiation of the quota scheme, compliance is hardly observed. The indiscipline has adverse effect on OPEC policy implementation by eroding the market power of the as the market believes that OPEC does not keep to its quotas.

5.6.2 The Emergent Production of Non-OPEC Countries and Its Effects

The recurring oil crises in 1973, 1979 and 1990 in some way has been beneficial to non-OPEC countries by compelling the multinational oil companies to seek for alternatives sources of energy outside OPEC regions. Oil sources that were once thought to be uneconomical were now been exploited, in spite of the high cost of exploration and production. This phenomenon gradually challenge the oil monopoly enjoyed by OPEC for decades as more oil start to flow from the West, breaking the established norm of oil supply from the East. This phenomenon has not only erodes the power OPEC exert on oil market, it has in some way rendered some of the organisation's policies ineffective. In the past OPEC has influenced oil prices to its own benefits. However, in recent times cutting production quotas in order to increase oil price have turned out to be ineffective. This is due to oil supply coming from non-OPEC producers such as the United States and Canada who continue to supply at their maximum capability regardless of the global demand for oil. This renders OPEC policy of production cut ineffective and thereby diminishes the cartel's market influence.

5.6.3 OPEC and Its Place in the Economic and Geopolitical World

In the years after the establishment of OPEC, the organisation wielded remarkable influence on the global stage. The ministerial meetings as they are commonly known do have huge global economic effects and therefore get significant international media coverage. However, in recent times this status is fast eroding.

The recent fall in the oil prices fuelled by the thriving U.S shale industry and the inability of OPEC to control the situation may signal the decline in the power of the cartel. The longstanding world order in oil is breaking up at a fast rate, reordering geopolitical and economic power in the course as market forces are reinstating themselves. The latest OPEC meeting held in Vienna in early June ended without the member countries agreeing on how to tackle the crisis that has befallen the oil market. This is the second time in two months OPEC has failed to find a common ground to ease the economic hardship that is facing most of its members. The oil market is slowly shifting away from been dominated unilaterally by OPEC, into a broader atmosphere where all other oil producing countries are also having their say. Hence, ‘OPEC that once has the oil market at its grip’ can no longer boast of such influence that it once possessed.

5.7 Chapter Summary

The chapter analysed the findings of this study in the framework of the literature reviewed. The results of the study uphold are in line with quite a number of the previous studies on the impact of OPEC on oil prices, while other findings negated some previous studies or provided new findings.

The subsequent chapter brings the dissertation to a close by providing conclusions from the overall research study. A range of limitations encountered while writing the dissertation will be discussed and lastly areas to consider for future research studies are highlighted.

Chapter Six Conclusion

6.1 Chapter Overview

The chapter summarises the key findings of this study and considers the key implications of these results in relation to the research problem and the literature. The chapter is laid out as follows; Section 6.2 provides the summary of the research findings. Section 6.3 outlines the limitations of the study. Lastly, section 6.4 highlights the gap in this research and the issues the future research can address.

6.2 Summary of Research Findings

This study sought evidence of the impact of OPEC Conference announcements on oil prices. The secondary objectives are divided into three which are; (1) to examine oil price changes around OPEC announcements, taking into consideration the corresponding rate of oil prices at the time of the announcement, (2) to examine if the level of impact is subject to the type of decision announced and (3) to examine oil price changes around OPEC announcements taking into consideration prior market expectations and the corresponding level of oil prices at the period of the announcement. In order to address the main objective of this study, the quantitative approach using mean-adjusted returns model was adopted. The movements in oil price were examined in the estimation window which is a 30-day period as well as the event window which is a 20-day period. In addition, the oil price reaction to OPEC announcements was examined for a 10-year period 2005 to 2014.

In general, this study finds that OPEC announcements do not have any significant impact on oil price which is broadly in agreements with the findings of Aljajji and Huettnner (2000). However, there is mixed evidence in regards to the impact of OPEC on oil prices when the researcher considers market expectation and OPEC decision. In some of the event window, the price movement is different to zero while in other cases the price movement is not different to zero. This result is in line with the findings of Loderer (1985) who found mixed evidence that OPEC is influencing oil prices.

The influence of OPEC on price is fast eroding due to the failure of its members to adhere to the quotas. The lack of disciplinary measures for any member who fails to follow laid down rules and regulations does not help matter either. Moreover, the increase in oil production from the non-OPEC countries especially the U.S through its oil fracking seems to be diminishing the influence OPEC.

6.3 Limitations

The sample size used by the researcher is quite small. It will be difficult to get information if one decides to go any further as the information becomes lesser and lesser. Also, media coverage around OPEC meetings is variable. At some meetings there was very low media interest. This means that to determine the prior expectation is open to interpretations.

6.4 Recommendations

The study has managed to fill the gap in the literature identified in the research methodology chapter; however there is still a substantial area worth examining. The researcher considered prior market expectations to OPEC announcements and the type of OPEC decisions. Future studies could consider the Global GDP during the period of the OPEC announcement and the volatility in the oil market around the time of the announcement. Also, the effect of the recent slowdown in the Chinese economy on the oil market could be analysed and the results compared.

Bibliography

- Aasim, H. M., Rabah, A., Peter, B., Vikram, H., Thomas, H., Paulo, M., & Martin, S. (2015). *Global Implications of Lower Oil Prices*. International Monetary Fund.
- Adelman, M. (2002). World oil production & prices 1947-2000. *The quarterly review of Economics and Finance*, 169-191.
- Ahmed, K. (2015). *Oil: Shokcing how vital it still is*. BBC Corporation. BBC Corporation. Retrieved January 18, 2016, from <http://www.bbc.com/news/business-31604164>
- Amelie, C., & Olivie, D. (2009). The efficient of the crude oil markets: Evidence from variance ratio tests. *Energy Policy*, 37(11), 4267-4272.
- Amine, L., Constantin, M., & Andriopoulous, K. (2014). Do OPEC announcements influence oil prices?
- Amorim, V. B. (2015). Oil Price Drop Triggers Aussie Fund Review. *Global Money Management*.
- BBC News. (2015). *Nigeria raises borrowing in bubget as oil prices fall*. Retrieved January 20, 2016, from <http://www.bbc.com/news/business-35162111>
- BBC News: January. (2016). *Share markets slide as oil price falls below \$30*. Retrieved January 16, 2016, from <http://www.bbc.com/news/business-35320923>
- Brav, A., Christopher, G., & Gompers, P. (2000). Is the abnormal return following equity issuances anomalous. *financial economics* , 209-249.
- Calvani, T., Cseres, K., & Ehlermann, C.-D. (2006). *Criminalisation of competition law enforcement: Economic and legal impliactions for the EU members states*.
- Connor, J. M., & Bolotova, Y. (2006). Cartel overcharges: Survey and meta-analysis. *International journal of industrial organisation*, 1109-1137.
- Draper, D. (1984). The behaviour of event-related returns on oil futures contracts . *Journal of Futures Markets*, 125-132.
- Draper, D. W. (1984). The Behaviour of Event-Related Returns on Oil Futures Contracts. *The Journal of Finance Markets*, 4(2), 125.

- Economist. (2014). Why the oil price is falling. Retrieved August 11, 2016, from <http://www.economist.com/blogs/economist-explains/2014/12/economist-explains-4>
- Espen, S. (2014). Cartel Theory and Cartel Practice: The Case of the International Aluminum Cartels, 1901 - 1940. *Business History Review*, 88(3), 445-467.
- Fama, E. (1991). Efficient capital markets. *Journal of Finance*, II(46), 1575-1617.
- Financial Times. (2014). Opec members flounder in a flood of cheap oil: The cartel's weakness is welcome now, but a warning for the future.
- Financial Times: January. (2016). Oil Industry braced for new supply line.
- Franz, W., & Azra, K. (2004). The Impacts of OPEC Conference Outcomes on World Oil prices. *The energy Journal*, 45-62.
- Guidi, M. G., Russell, A., & Heather, T. (2006). The effect of OPEC policy decisions on oil and stock prices . 30(1).
- Hogan, S. (1996). Covariance analysis as an alternative event-study methodology . *Managerial Finance*, 54-61.
- Horan, S., J.H, P., & J, M. (2004). Implied volatility of oil futures options surrounding opec meetings. *Energy journal*, 25(3), 103-125.
- Independent . (2007). *Landmark case finds grandfather guilty in car price-fixing scam*.
- Irish Examiner. (2007). *Ford cartel secretary fined €30,000*.
- Kehinde, J. S. (2012). Share Price Change: the Efficient Market Hypothesis and the whitenoise Hypothesis Dichotomo. *International Journal of Humanities and Social Science*, 2.
- Leach, P. T. (2015). Chinese economy forecast to slow despite consumer market growth. 1-2.
- Learsy, R. J. (2007). *Over A Barrel: Breaking oil's grip on our future*. New York: Encounter Book.
- Lin, S. X., & Tamvakis, M. (2009). OPEC announcements and their effects on crude oil prices . 1010-1016.

- Ljiljana, P. (2015). Addressing responsibility of owners and managers in cartel agreements: A competition law perspective . *Economic and Social Development: Book of proceedings* .
- MacCallum, R. C., Widaman, K., & Zhang, S. S. (1999). Sample size in factor analysis . 84-99.
- Malhotra, N., Tandon, k., & Tandon, D. (2015). Testing the Empirics of Weak Form of Efficient Market Hypothesis: Evidence from Asia-Pacific Markets. *IUP Journal of Applied Finance*, 21(4), 18-37.
- Malkiel, B. G. (2005). Reflections on the Efficient Market Hypothesis: 30 Years Later. *The Financial Review*, 40, 1-9.
- Manning, N. (1991). The UK Oil Industry: Some inferences from the efficient market hypothesis. *Scottish Journal of Political Economy*, 38(4), 324-334.
- Matsumoto, K., Voudouris, V., Stasinopoulos, D., & Di Maio, C. (2012). Exploring crude oil production and export capacity of the OPEC Middle East countries. *Energy Policy* , 820-828.
- McWilliams, A., Siegel, D., & Teoh, S. H. (1999). Issues in the use of the event study methodology: a critical analysis of corporate social responsibility studies. *Sage*.
- Mehwish, N., & Yasir, b. T. (2015). The Efficient Market Hypothesis: A Critical Review of the Literature. *IUP Journal of Financial Risk Management*, 12(4), 48-63.
- Mirza, A. (2014). Price of oil likely to fall in 2014. *MEED: Middle East Economic Digest*, 26-27.
- New York Times. (2016). *Oil Prices: What's Behind the Drop? Simple Economics*. Retrieved from http://www.nytimes.com/interactive/2016/business/energy-environment/oil-prices.html?_r=0
- Newsmax. (2007). *If Opec is a cartel, why isn't it illegal?* Retrieved November 13, 2015, from <http://www.newsmax.com/Newsfront/opec-cartel-illegal/2009/12/12/id/341497/>
- opec.org. (2014). *OPEC share of the world crude oil reserves*. Retrieved July 06, 2016, from http://www.opec.org/opec_web/en/data_graphs/330.htm

- opec.org. (2015). *Organisation of the Petroleum Exporting Countries*. Retrieved November 12, 2015
- Pekarskiene, I., & Bruneckiene, J. (2015). The relationship between Cartels and Economic Fluctuations. 284-294.
- Peterson, P. (1989). Event Studies: A review of Issues and Methodologies. *Quarterly Journal of Business and Economics*, 28(3), 36-66.
- Pindyck, R. (1999). The long-run evolution of energy prices. *Energy Journal*, 1-27.
- Radelet, S., & Sachs, J. (1998). The Onset of the East Asian Financial Crisis. *the national bureau of economic research*.
- Rte. (2014). *EU fines Infineon, Philips and Samsung €138m for forming smart-card chip cartel*. Retrieved from <http://www.rte.ie/news/business/2014/0903/641180-ec-fine-cartel/>
- Smith, J. (2005). Inscrutable OPEC? Behavioral Tests of the Cartel Hypothesis. *The Energy Journal*, 26(1), 51-82.
- The Economist . (2014). *Why the oil price is falling*. Retrieved August 7, 2016, from <http://www.economist.com/blogs/economist-explains/2014/12/economist-explains-4>
- The Economist. (2014). *OPEC: Making the best of a low price*.
- The Economist. (2014). Why is oil price falling. Retrieved July 2, 2016, from <http://www.economist.com/blogs/economist-explains/2014/12/economist-explains-4>
- The Economist. (2014). *Why the oil price is falling*. Retrieved March 21, 2016, from <http://www.economist.com/blogs/economist-explains/2014/12/economist-explains-4>
- The New York Times. (2008). *Oil Prices Drop to 20-Month Low*. Retrieved August 7, 2016, from http://www.nytimes.com/2008/11/12/business/worldbusiness/12oil.html?_r=0
- theguardian . (2015). *Oil price falls as Saudi Arabia pushes Opec cartel to hold production levels*.
- Time. (2008). What Caused the Big Slide in Oil Prices. Retrieved August 11, 2016, from <http://content.time.com/time/business/article/0,8599,1859380,00.html>

www.opec.org. (2008, December 17). *151st (Extraordinary) Meeting of the OPEC Conference*. Retrieved August 6, 2016, from http://www.opec.org/opec_web/en/945.htm

www.opec.org. (2011, June 08). *Opening address to the 159th Meeting of the OPEC Conference*. Retrieved August 06, 2016, from http://www.opec.org/opec_web/en/press_room/2071.htm

Yudong, M., & Li, L. (2010). Is WIT crude oil market becoming wealy efficient over time? New evidence from multiscale analysis based on detrended fluctuation analysis. *32*(5), 987-992.

Appendices

Appendix A: Personal Reflection

1. A summary of the key learning that you have divided from each stage of completing the dissertation commencing with topic selection.

From the beginning of writing my dissertation I was very pleased with my chosen topic due to the fact that oil has always had a direct impact on my everyday life since childhood. Being the main source of revenue for my country Nigeria, the global oil market has always defined the state of its economy. I have had first-hand experience of how changes in global oil prices over the years have influence the social dynamics of my local community. Due to my passion for the topic, I was so over enthusiastic that I anticipated to cover too many areas when I submitted my proposal in November. It was my intentions to also examine whether my country will be better off leaving OPEC and the effects of the recent fall in oil price on the Nigerian economy. After my first meeting with my supervisor and we talked about the amount of data and time needed to cover all the areas I have in my proposal, it was then that I understood I had too much on my plate. I realised that I should always evaluate what is ahead carefully and not to over exceed my competences no matter how passionate I am about it.

After the second semester examination was over in May, I felt I had all the time in the world to work at my own pace on my dissertation since the classes were over and examination became a thing of the past. I soon realised this was far from reality as I needed to do more shifts at work. However, I was able to combine efficiently the time and energy needed for my dissertation and the demand from work as I wrote out what I have to do every day in my diary before I start my day. Looking back at this critical and stressful period, I am very pleased with how I was able handle the pressure and the time constraint. It was my second real learning, to manage and effectively used the limited time available.

In conclusion, the biggest learning that I obtained from writing this dissertation is about me as a researcher. I respond well to suggestions and constructive criticism. I have developed my analytical and research skills throughout the cause of writing this dissertation. There were times that that the pressure was so much that I felt I could not handle it anymore. However, I just kept on going. This reminds me of one of the sayings

of Henry Ford “If you believe you can’t, then you can’t. But if you believe you can, then you can”. Now, I can confidently say I am a better academic writer and have improved my knowledge of oil market and the geopolitical forces that shape it.

2. What would you do differently?

Looking back at the whole process from the very beginning, the major area that I will do differently will be to use my time more effectively. One of the main areas that I have improved on was time management, nevertheless, having a well laid out time frame for the dissertation will have made my work much easier and probably reduced the pressure I encountered. I have learned to have a realistic time allocation for the work rather than set an unrealistic time and feel frustrated and disappointed when I cannot meet achieve my objective at the end of the allocated time.

Another area that caused some struggle was finding someone to proof read my dissertation. I waited still the very last before I asked my friend who is a PHD student in WIT to proof read my dissertation. Due to the time constraint, he could only proof read the discussion chapter. Next time I will do this in a more early stage then I did now so that there can be enough time to have all the chapters proof read as well as have more people to proof read it.

3. How would you use the learning and skills that you have derived and developed in the future?

I am confident that many of the skills and learning that I have acquired throughout the course of writing this dissertation will be of enormous important in my professional career. The time management skills I have learnt will definitely help me in how I prioritise my work and manage my time when I eventually find myself in a work environment.

Moreover, the analytical skills I have acquired writing this dissertation and the ability to critically evaluate situations will be of immense advantage in my professional career.

Lastly, I have developed confidence doing this dissertation which I can always think of when times will get difficult in the future. This will motivate me to think positive and believe in myself that I can do whatever I set my mind to do. Now I know that tough time never last but tough people do.

Appendix B: Oil price

Oil Price (WTI) *Forty days before OPEC announcements to ten days after OPEC announcements*

OPEC Meetings	Date	-40	-39	-38	-37	-36	-35	-34	-33	-32	-31
134	30/01/2005	45.56	43.31	42.56	42.96	41.51	41.96	42.41	40.71	41.06	41.76
135	16/03/2005	48.46	47.61	47.01	48.31	48.61	49.43	48.8	48.8	47.15	48.25
136	15/06/2005	52.33	52.45	52.49	54.16	53.16	54.33	51.37	51.92	49.2	50.94
137	20/09/2005	58.16	59.05	59.12	59.91	60.71	61.51	61.87	60.76	61.6	62.44
138	12/12/2005	63.05	62.61	64.26	62.94	62.11	61.04	61.05	60.63	62.83	60.85
139	31/01/2006	58.46	59.31	59.91	59.96	59.21	60.66	59.41	61.36	61.36	60.86
140	08/03/2006	63.56	63.41	63.91	63.96	63.86	66.36	65.76	66.86	68.16	68.06
141	01/06/2006	65.75	67.76	67.22	67.02	68.29	69.03	68.53	69.53	70.3	71.28
142	11/09/2006	76.8	75.7	73.87	72.79	74	73.52	74.29	73.46	73.82	74.5
143	14/12/2006	58.91	57.66	58.55	57.35	56.74	57.55	59.09	60.27	60.75	58.41
144	15/03/2007	52.3	50.51	51.98	51.11	53.61	54.24	53.49	55.38	54.01	57.03
145	11/09/2007	74.11	74.03	75.03	75.9	75.53	74.65	73.38	75.74	74.96	77.03
146	05/12/2007	78.97	80.23	81.3	83.05	83.73	86.19	87.58	87.19	89.48	88.58
147	01/02/2008	88.31	87.45	90.25	88.23	87.72	90.12	94.41	92.35	91.3	90.69
148	05/03/2008	95.08	96.43	95.64	93.92	92.74	94.23	91.87	90.8	90.11	90.55
149	10/09/2008	138.68	134.63	129.43	128.94	131.43	127.25	123.73	124.62	122.59	124.72
150	24/10/2008	115.58	115.5	109.63	109.38	107.99	106.47	106.35	103.23	102.66	100.95
151	17/12/2008	74.08	71.29	66.92	67.17	63.34	61.92	62.8	67.45	65.79	68.1
152	15/03/2009	35.41	35.38	38.57	42.56	42.33	45.12	46.5	41.67	42.04	41.58
153	28/06/2009	52.18	54.45	53.81	56.29	56.67	58.58	57.79	58.81	58	58.58
154	10/09/2009	61.49	62.07	63.56	63.93	64.81	64.58	66.1	66.96	68.34	67.24
155	22/12/2009	78.61	79.45	77.39	79.84	77.04	78.08	79.58	80.3	79.64	77.4
156	17/03/2010	78.98	77.42	75.84	74.25	74.9	74.67	73.64	73.62	72.85	74.41
157	14/10/2010	75.39	74.45	73.45	72.71	71.24	72.07	73.36	75.17	74.69	71.93
158	11/12/2010	81.23	83.06	79.57	81.93	80.03	81.15	82	82.6	81.9	82.2
159	08/06/2011	109.5	105.75	106.6	107.73	109.17	106.7	107.18	110.84	111.72	111.68
160	14/12/2011	88.34	86.11	86.07	87.19	91.12	92.98	90.2	93.96	93.32	93.19
161	14/06/2012	102.65	102.38	103.58	102.68	103.1	103.72	104.56	104.86	104.89	106.17
162	12/12/2012	92.07	92.04	92	90	88.3	86.65	85.39	85.59	85.84	85.52
163	31/05/2013	93.26	92.76	93.36	94.18	94.59	93.44	91.23	88.75	88.73	86.65
164	04/12/2013	103.07	103.54	101.63	103.08	102.17	102.46	101.15	102.34	100.72	99.28
165	11/06/2014	104.05	103.7	103.71	104.33	104.35	101.69	101.47	102.2	100.85	101.13
166	27/11/2014	91.02	89.76	90.33	88.89	87.29	85.76	85.87	85.73	81.72	81.82

OPEC Meetings	Date	-30	-29	-28	-27	-26	-25	-24	-23	-22	-21
134	30/01/2005	44.21	44.16	46.31	45.57	45.76	44.05	42.19	41.26	41.78	43.69
135	16/03/2005	47.1	46.65	46.4	46.45	45.35	45.4	45.45	47.05	47.15	47.5
136	15/06/2005	49.6	50.22	51.12	51.3	52.04	51.76	50.39	48.83	48.65	48.64
137	20/09/2005	63.92	63.13	64.8	65.67	66.71	66.21	66.11	63.29	63.47	65.51
138	12/12/2005	61.03	61.3	59.8	59.85	59.75	61.7	60.6	59.4	59.7	59.65
139	31/01/2006	60.01	58.01	57.31	57.81	58.56	58.08	58.08	58.16	59.81	60.26
140	08/03/2006	66.83	65.6	65.8	67.81	68.36	67.86	66.61	64.71	65.41	65.11
141	01/06/2006	72.07	71.96	73.73	70.19	67.43	71.71	70.76	71.8	73.75	74.62
142	11/09/2006	73.3	74.56	74.93	76.16	75.59	74.78	77.05	76.29	76.28	74.17
143	14/12/2006	58.72	58.64	57.87	59.13	60.11	58.94	59.93	61.18	59.66	58.59
144	15/03/2007	58.17	57.35	59.01	58.69	58.91	57.75	59.76	59.86	57.76	58.98
145	11/09/2007	76.82	78.2	76.49	76.84	75.41	72.03	72.25	72.23	71.62	71.49
146	05/12/2007	87.6	86.45	88.3	92.09	91.73	93.45	90.33	94.16	93.53	95.8
147	01/02/2008	89.93	91.11	90.88	93.19	94	95.89	96.63	96.03	95.95	99.64
148	05/03/2008	89.64	87.65	89.98	90.37	90.99	91.66	92.34	91.67	89.03	90.07
149	10/09/2008	122.21	126.74	124.17	125.03	121.45	118.71	118.57	119.84	115.42	114.44
150	24/10/2008	101.19	95.52	91.49	97.39	97.5	104.05	122.61	107.85	106.84	111.54
151	17/12/2008	63.93	70.41	65.41	60.72	61.06	62.19	59.38	55.95	58.31	57.18
152	15/03/2009	41.73	41.35	40.87	40.27	41.15	40.24	39.58	37.54	35.93	34.03
153	28/06/2009	56.52	58.99	59.52	61.45	60.49	61.15	62.48	63.41	65.09	66.31
154	10/09/2009	63.42	66.9	69.26	71.59	71.4	71.97	71.96	70.97	70.59	69.46
155	22/12/2009	79.44	79.01	79.16	77.25	76.34	78.91	79.08	79.55	77.47	76.83
156	17/03/2010	77.21	76.96	73.13	71.15	71.87	73.71	74.48	75.23	74.11	76.98
157	14/10/2010	73.97	74.99	74.52	73.98	74.65	74.25	76.4	77.17	76.78	75.92
158	11/12/2010	81.45	82.94	83.91	84.45	86.49	86.85	87.07	87.04	87.77	87.77
159	08/06/2011	111.72	112.31	112.38	113.39	113.03	110.6	108.79	99.89	96.87	100.32
160	14/12/2011	92.19	92.51	94.07	94.26	95.52	96.8	95.74	97.78	98.99	98.14
161	14/06/2012	105.25	102.56	98.49	97.86	97.13	96.8	97.1	96.03	94.75	93.97
162	12/12/2012	85.65	86.23	87.05	84.9	85.64	88.62	84.5	85.07	86.08	85.56
163	31/05/2013	87.83	88.04	88.81	89.21	91.07	93.27	92.63	94.09	93.22	90.74
164	04/12/2013	97.63	96.9	96.65	97.4	98.74	98.29	96.81	96.29	94.56	94.58
165	11/06/2014	101.56	100.07	99.69	100.09	99.74	99.81	101.06	100.52	100.32	100.89
166	27/11/2014	82.33	82.8	82.76	83.25	80.52	82.81	81.27	81.26	81.36	82.25

OPEC Meetings	Date	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11
134	30/01/2005	43.36	42.16	43.96	43.41	45.51	45.32	45.31	45.66	46.46	48.11
135	16/03/2005	47.3	48.35	47.5	48.45	51	51.73	52.05	52.2	51.75	51.67
136	15/06/2005	48.97	46.99	47	47.25	48.68	49.14	50.37	50.89	51.65	52.08
137	20/09/2005	65.46	65.81	67.1	67.29	66.05	67.41	69.91	68.63	69.5	66.91
138	12/12/2005	57.8	57.45	57.6	57.05	57.85	56.2	56.3	57.75	58.3	58.35
139	31/01/2006	61.06	63.11	63.41	62.81	64.21	63.56	63.41	63.91	63.96	63.86
140	08/03/2006	63.01	62.51	62.66	62.01	61.26	59.61	57.61	58.61	59.76	61.21
141	01/06/2006	72.26	69.98	70.09	69.75	70.71	72.15	73	71.87	69.25	69.4
142	11/09/2006	74.38	73.33	72.95	71.64	70.12	70.93	72.45	72.55	71.45	72.02
143	14/12/2006	58.28	58.79	56.23	55.9	56.42	58.01	57.28	60.3	60.97	62.45
144	15/03/2007	58	57.92	59.38	58.32	59.4	60.28	60.28	61.41	61.46	61.78
145	11/09/2007	71.6	72.4	73.36	70.99	71.9	71.12	69.49	69.3	69.86	71.17
146	05/12/2007	94.06	96.65	96.46	95.51	96.36	94.4	91.18	94.02	93.37	94.81
147	01/02/2008	99.17	97.9	95.08	96.43	95.64	93.92	92.74	94.23	91.87	90.8
148	05/03/2008	88.32	87.16	88.07	91.77	93.56	92.82	93.28	95.42	95.57	99.99
149	10/09/2008	113.1	115.96	115.05	113.46	112.92	114.39	115.48	121.23	114.48	114.85
150	24/10/2008	106.77	96.29	100.7	98.23	93.84	93.91	88.15	90.18	88.94	86.5
151	17/12/2008	55.14	54.42	53.64	48.86	49.22	53.63	50.02	54.2	49.34	47.05
152	15/03/2009	37.63	34.96	34.67	39.6	39.35	37.66	38.86	41.64	43.18	44.15
153	28/06/2009	68.59	68.58	66.14	68.8	68.43	68.05	70.02	71.38	72.69	72.13
154	10/09/2009	70.08	70.57	67.51	66.72	69.22	72.54	72.4	73.12	73.68	71.6
155	22/12/2009	76.49	74.88	77.25	75.95	77.19	78.39	76.62	76.42	75.41	73.89
156	17/03/2010	77.27	78.97	79.77	80.04	78.61	79.75	77.99	79.72	78.71	79.62
157	14/10/2010	74.58	73.63	74.81	72.96	72.98	73.4	74.63	76.51	76.15	77.85
158	11/12/2010	84.89	84.88	82.33	80.43	81.88	81.65	81.24	80.79	83.21	83.87
159	08/06/2011	103.39	97.88	98.53	99.21	96.91	96.4	99.52	97.99	99.15	97.06
160	14/12/2011	99.37	102.59	98.82	97.67	96.73	97.76	96.16	96.91	98.21	99.79
161	14/06/2012	92.78	92.53	91.51	92.57	91.44	89.4	90.36	90.64	90.75	87.79
162	12/12/2012	85.38	86.32	85.45	86.62	89.05	86.46	87.08	87.01	87.28	86.81
163	31/05/2013	93.7	95.25	95.8	95.28	96.24	96.09	95.81	94.76	93.96	93.95
164	04/12/2013	93.4	94.74	94.25	94.56	95.13	93.12	93.91	93.76	93.8	93.03
165	11/06/2014	102.01	102.63	101.74	102.31	102.95	102.8	104.31	104.03	105.01	104.78
166	27/11/2014	81.06	80.53	78.77	77.15	78.71	77.87	78.71	77.43	77.85	77.16

OPEC Meetings	Date	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
134	30/01/2005	48.41	48.46	47.61	47.01	48.31	48.61	49.43	48.8	48.8	47.15
135	16/03/2005	53	53.6	53.7	53.9	54.55	54.75	53.52	54.4	54.9	55.05
136	15/06/2005	54.4	53.46	55.08	54.46	53.84	52.51	54.36	53.55	55.47	55.03
137	20/09/2005	65.83	64.38	64.8	64.21	63.29	63.18	65.2	64.64	62.91	67.21
138	12/12/2005	57.36	56.46	57.33	58.46	59.31	59.91	59.96	59.21	60.66	59.41
139	31/01/2006	66.36	65.76	66.86	68.16	68.06	66.83	65.6	65.8	67.81	68.36
140	08/03/2006	59.03	58.03	61.46	61.01	61.37	62.01	63.36	63.61	62.46	61.51
141	01/06/2006	68.65	69.63	68.44	69.23	70.78	69.47	70.92	71.35	71.85	71.42
142	11/09/2006	72.13	70.47	69.74	70.2	70.38	69.24	68.7	67.75	67.37	66.3
143	14/12/2006	62.97	63.43	62.39	62.4	62.2	62.54	62.06	61.26	61.06	61.34
144	15/03/2007	61.97	61.58	60.05	60.66	61.85	61.63	60.06	58.94	58.03	58.15
145	11/09/2007	71.98	71.79	73.52	73.37	73.98	75.07	75.74	76.34	76.7	77.53
146	05/12/2007	95.75	99.16	98.57	97.66	94.39	90.71	90.98	88.6	89.29	88.31
147	01/02/2008	90.11	90.55	89.64	87.65	89.98	90.37	90.99	91.66	92.34	91.67
148	05/03/2008	100.86	98.57	99.03	99.4	100.83	99.59	102.6	101.78	102.42	99.72
149	10/09/2008	116.31	118.17	115.58	115.55	109.63	109.38	107.99	106.47	106.35	103.23
150	24/10/2008	77.44	81.17	78.69	74.38	69.81	71.9	74.08	71.29	66.92	67.17
151	17/12/2008	46.79	43.8	41.01	43.69	42	43.1	47.77	46.27	44.61	43.84
152	15/03/2009	40.07	41.57	45.28	43.54	45.43	47.01	45.68	42.46	46.91	46.22
153	28/06/2009	70.54	70.47	71.07	71.42	69.6	67.09	68.81	68.14	69.7	69.16
154	10/09/2009	71.38	72.49	72.72	69.97	68.11	68.03	67.9	67.95	71.08	71.27
155	22/12/2009	72.59	70.67	70.54	69.86	69.48	70.62	72.64	72.58	73.3	72.71
156	17/03/2010	80.91	80.21	81.5	81.85	81.5	82.07	82.1	81.26	79.79	81.75
157	14/10/2010	79.95	81.57	81.43	82.83	83.21	81.34	82.66	82.18	81.67	83.03
158	11/12/2010	85.73	84.12	86.75	87.98	89.18	89.33	88.69	88.3	88.35	87.81
159	08/06/2011	99.13	100.78	100.18	100.58	102.7	100.3	100.41	100.28	99.07	99.18
160	14/12/2011	100.36	100.2	100.97	100.94	101.25	100.45	98.35	99.4	97.77	100.24
161	14/06/2012	86.52	83.17	83.95	84.31	85.05	84.78	84.08	82.58	83.35	82.56
162	12/12/2012	86.1	87.64	88.54	88.69	88.04	87.36	85.47	85.45	84.14	85.36
163	31/05/2013	94.85	95.72	96.29	95.55	93.98	94.12	93.84	94.65	93.13	93.57
164	04/12/2013	93.35	93.34	95.35	94.53	93.86	93.41	92.05	92.55	93.61	95.83
165	11/06/2014	103.37	104.26	103.4	103.07	103.34	103.27	103.17	103.32	105.09	105.02
166	27/11/2014	74.13	75.91	75.64	74.55	74.55	75.63	76.52	75.74	74.04	73.7

OPEC Meetings	Date	0	1	2	3	4	5	6	7	8	9	10
134	30/01/2005	48.25	47.1	46.65	46.4	46.45	45.35	45.4	45.45	47.05	47.15	47.5
135	16/03/2005	56.5	56.4	56.8	56.7	55.95	49.43	49.7	54.06	54.26	53.96	55.31
136	15/06/2005	55.53	56.48	58.4	59.19	58.9	58.27	59.23	59.63	59.78	58.32	57.23
137	20/09/2005	66.24	66.96	67.07	64.67	65.98	64.94	66.36	66.83	66.21	65.36	63.74
138	12/12/2005	61.36	61.36	60.86	60.01	58.01	57.31	57.81	58.56	58.08	58.08	58.16
139	31/01/2006	67.86	66.61	64.71	65.41	65.11	63.01	62.51	62.66	62.01	61.26	59.61
140	08/03/2006	60.06	60.51	59.91	61.81	63.01	62.11	63.46	62.81	60.31	60.41	60.03
141	01/06/2006	70.11	72.73	72.5	72.43	70.9	70.25	71.62	70.28	68.48	69.12	69.78
142	11/09/2006	65.42	63.81	64.09	63.27	63.3	63.84	61.77	60	61.62	59.79	60.74
143	14/12/2006	62.48	63.4	62.19	62.87	63.08	62.05	61.81	61.07	60.31	60.39	60.85
144	15/03/2007	57.52	57.06	56.65	56.41	56.98	60.12	61.07	61.77	62.98	64.11	66.1
145	11/09/2007	78.16	79.85	80.05	79.14	80.55	81.51	81.99	83.85	83.38	82.51	81.2
146	05/12/2007	87.45	90.25	88.23	87.72	90.12	94.41	92.35	91.31	90.69	89.93	91.11
147	01/02/2008	89.03	90.07	88.32	87.16	88.07	91.77	93.56	92.82	93.28	95.42	95.57
148	05/03/2008	104.45	105.51	105.12	107.9	108.73	109.86	110.21	110.03	105.74	109.57	103.25
149	10/09/2008	102.66	100.95	101.19	95.52	91.49	97.39	97.5	104.05	122.61	107.85	106.84
150	24/10/2008	63.34	61.92	62.8	67.45	65.79	68.1	63.93	70.41	65.41	60.72	61.06
151	17/12/2008	40.17	36.73	33.17	31.1	30.28	32.94	37.58	39.89	38.95	44.6	46.17
152	15/03/2009	47.33	48.97	48.12	51.46	51.55	53.05	53.36	52.24	53.87	52.41	48.49
153	28/06/2009	71.47	69.82	69.32	66.68	64.06	62.88	60.15	60.36	59.93	59.69	59.62
154	10/09/2009	71.95	69.34	68.86	70.81	72.5	72.48	71.95	69.74	71.5	68.74	65.74
155	22/12/2009	73.48	76.03	76.83	78.67	78.87	79.35	79.39	81.52	81.74	83.12	82.6
156	17/03/2010	82.93	82.16	80.58	81.26	81.68	80.29	80.25	79.75	81.92	82.14	83.45
157	14/10/2010	82.71	81.23	83.06	79.57	81.93	80.03	81.15	82	82.6	81.9	82.2
158	11/12/2010	88.62	88.33	88.66	87.71	88.02	88.68	89.3	89.83	90.84	90.99	91.48
159	08/06/2011	100.77	101.95	99.3	97.2	99.37	94.83	94.95	93.02	93.23	93.7	94.96
160	14/12/2011	94.92	93.84	93.55	93.86	97.16	98.54	99.42	99.72	101.29	99.44	99.68
161	14/06/2012	83.83	84.03	83.26	83.99	81.06	77.91	79.33	78.76	79.34	80.27	77.72
162	12/12/2012	86.35	85.39	86.32	86.71	87.46	89.09	89.76	88.2	88.29	90.71	90.91
163	31/05/2013	91.93	93.41	93.36	93.66	94.71	96.11	95.82	95.5	95.98	96.66	97.83
164	04/12/2013	96.97	97.14	97.48	97.1	98.32	97.25	97.21	96.27	97.18	96.99	97.59
165	11/06/2014	105.04	107.2	107.49	107.52	106.95	106.64	107.08	107.95	106.83	106.64	107.04
166	27/11/2014	65.94	68.98	66.99	67.3	66.73	65.89	63.13	63.74	60.99	60.01	57.81

Reference: U.S Energy Information Administration (EIA)

Appendix C: OPEC Announcements on Production Quotas

OPEC Conference announcements on production outputs for thirty-three meetings from 1st January 2005 – 31st December 2014

MEETINGS	DATE	PRODUCTION (000,000) b/d	CHANGE IN OUTPUT (000,000) b/d	% CHANGE IN OUTPUT	CHANGE
134	30/01/2005	27			
135	16/03/2005	27.5	0.5	1.85%	INCREASE
136	15/06/2005	28	0.5	1.82%	INCREASE
137	20/09/2005	28	0	0.00%	UNCHANGE
138	12/12/2005	30	2	7.14%	INCREASE
139	31/01/2006	28	-2	-6.67%	DECREASE
140	08/03/2006	28	0	0.00%	UNCHANGE
141	01/06/2006	28	0	0.00%	UNCHANGE
142	11/09/2006	28	0	0.00%	UNCHANGE
143	14/12/2006	27.5	-0.5	-1.79%	DECREASE
144	15/03/2007	27.5	0	0.00%	UNCHANGE
145	11/09/2007	28	0.5	1.82%	INCREASE
146	05/12/2007	28	0	0.00%	UNCHANGE
147	01/02/2008	28	0	0.00%	UNCHANGE
148	05/03/2008	28	0	0.00%	UNCHANGE
149	10/09/2008	28.8	0.8	2.86%	INCREASE
150	24/10/2008	27.3	-1.5	-5.21%	DECREASE
151	17/12/2008	24.8	-2.5	-9.16%	DECREASE
152	15/03/2009	24.8	0	0.00%	UNCHANGE
153	28/05/2009	24.8	0	0.00%	UNCHANGE
154	10/09/2009	24.8	0	0.00%	UNCHANGE
155	22/12/2009	24.8	0	0.00%	UNCHANGE
156	17/03/2010	24.8	0	0.00%	UNCHANGE
157	14/10/2010	24.8	0	0.00%	UNCHANGE
158	11/12/2010	24.8	0	0.00%	UNCHANGE
159	08/06/2011	30	5.2	20.97%	INCREASE
160	14/12/2011	30	0	0.00%	UNCHANGE
161	16/06/2012	30	0	0.00%	UNCHANGE
162	12/12/2012	30	0	0.00%	UNCHANGE
163	31/05/2013	30	0	0.00%	UNCHANGE
164	04/12/2013	30	0	0.00%	UNCHANGE
165	11/06/2014	30	0	0.00%	UNCHANGE
166	27/11/2014	30	0	0	UNCHANGE

Reference: www.opec.org

Appendix D: OPEC Production Discrepancies

OPEC Crude Oil (excluding condensates) Supply (Million Barrels per Day)

	Year									
Countries	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Algeria	1.35	1.37	1.37	1.37	1.28	1.27	1.27	1.25	1.19	1.15
Angola	1.23	1.37	1.68	1.89	1.82	1.85	1.7	1.73	1.74	1.68
Ecuador	0.53	0.54	0.51	0.5	0.49	0.49	0.5	0.5	0.53	0.56
Iran	3.94	3.77	3.7	3.85	3.79	3.75	3.66	2.99	2.68	2.8
Iraq	1.87	1.99	2.08	2.37	2.37	2.37	2.6	2.96	3.03	3.34
Kuwait	2.53	2.54	2.46	2.57	2.3	2.25	2.48	2.58	2.6	2.57
Libya	1.63	1.68	1.7	1.74	1.65	1.65	0.47	1.37	0.92	0.47
Nigeria	2.44	2.22	2.12	1.94	1.8	2.05	2.31	2.1	1.95	2
Qatar	0.8	0.82	0.81	0.85	0.83	0.85	0.85	0.75	0.73	0.72
Saudi Arabia	9.55	9.15	8.72	9.26	8.22	8.86	9.42	9.79	9.65	9.7
UAE	2.43	2.53	2.49	2.57	2.3	2.3	2.56	2.68	2.7	2.7
Venezuela	2.52	2.47	2.39	2.4	2.4	2.3	2.4	2.4	2.4	2.4
OPEC Total Output	30.83	30.45	30.06	31.31	29.26	29.98	30.02	31.11	30.12	30.08
OPEC Quota Announcement	28.1	27.9	27.8	27.4	24.8	24.8	30	30	30	30
Difference	2.73	2.55	2.26	3.91	4.46	5.18	0.02	1.11	0.12	0.08

Reference: U.S Energy Information Administration (EIA) & www.opec.org

Appendix D displays the total crude oil supply (Million barrels per day) from each of the twelve OPEC countries. The researcher noticed that there were little discrepancies between the total crude oil supply by all the OPEC countries and the production quotas OPEC announced at the end of each Conference meeting. The reason for this is that many of the members do not keep to the agreed quotas most of the time. There is high degree of indiscipline in the organisation and the absence of sanctions for failure to keep to the agreed quota makes member states to do what is best in their own interest regardless of the adverse effects on the organisation.

Appendix E: World Total Oil Supply (Million Barrels Per Day) from 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
OPEC	30.83	30.45	30.06	31.31	29.26	29.98	30.02	31.11	30.12	30.08
Others	54.271	54.703	55.107	55.26	56.478	58.136	58.516	59.036	60.784	63.017
Total World Output	85.101	85.153	85.167	86.570	85.738	88.116	88.536	90.461	90.904	93.097

Reference: U.S Energy Information Administration (EIA)

Appendix F: Oil Price Movements

Oil Price movements around the time of OPEC announcements.

NB: *-1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=33*

OPEC Meetings	Date	% Δ in Actual Price -1 +1	% Δ in Expected Price -1 +1	% Δ in Abnormal Price +1 -1	% Δ in Actual Price -2 +2	% Δ in Expected Price -2 +2	% Δ in Abnormal Price -2 +2
134	30/01/2005	-0.11%	0.46%	-0.57%	-4.41%	0.92%	-5.33%
135	16/03/2005	2.45%	0.48%	1.97%	3.46%	0.95%	2.51%
136	15/06/2005	2.63%	0.02%	2.61%	5.28%	0.04%	5.24%
137	20/09/2005	-0.37%	1.00%	-1.37%	6.61%	2.01%	4.60%
138	12/12/2005	3.28%	-0.50%	3.78%	0.32%	-1.00%	1.32%
139	31/01/2006	-2.56%	0.63%	-3.19%	-4.57%	1.27%	-5.84%
140	08/03/2006	-1.63%	-0.23%	-1.40%	-4.08%	-0.45%	-3.63%
141	01/06/2006	1.83%	0.43%	1.40%	0.90%	0.86%	0.04%
142	11/09/2006	-3.76%	-0.42%	-3.34%	-4.87%	-0.84%	-4.03%
143	14/12/2006	3.36%	0.45%	2.91%	1.85%	0.90%	0.95%
144	15/03/2007	-1.87%	1.21%	-3.08%	-2.38%	2.41%	-4.79%
145	11/09/2007	2.99%	-0.25%	3.24%	4.37%	-0.50%	4.87%
146	05/12/2007	2.20%	1.31%	0.89%	-1.19%	2.61%	-3.80%
147	01/02/2008	-1.75%	0.23%	-1.98%	-4.35%	0.46%	-4.81%
148	05/03/2008	5.81%	0.38%	5.43%	2.64%	0.76%	1.88%
149	10/09/2008	-2.21%	-1.24%	-0.97%	-4.85%	-2.48%	-2.37%
150	24/10/2008	-7.82%	-1.70%	-6.12%	-6.16%	-3.40%	-2.76%
151	17/12/2008	-16.22%	-2.82%	-13.40%	-25.64%	-5.65%	-19.99%
152	15/03/2009	5.95%	1.82%	4.13%	2.58%	3.65%	-1.07%
153	28/06/2009	0.95%	2.29%	-1.34%	-0.55%	4.59%	-5.14%
154	10/09/2009	-2.71%	1.11%	-3.82%	-3.12%	2.23%	-5.35%
155	22/12/2009	4.57%	-0.39%	4.96%	4.82%	-0.78%	5.60%
156	17/03/2010	0.50%	0.10%	0.40%	0.99%	0.19%	0.80%
157	14/10/2010	-2.17%	0.25%	-2.42%	1.70%	0.50%	1.20%
158	11/12/2010	0.59%	0.25%	0.34%	0.35%	0.51%	-0.16%
159	08/06/2011	2.79%	-0.76%	3.55%	0.23%	-1.53%	1.76%
160	14/12/2011	-6.83%	0.88%	-7.71%	-4.32%	1.76%	-6.08%
161	14/06/2012	1.79%	-1.06%	2.85%	-0.11%	-2.12%	2.01%
162	12/12/2012	0.04%	-0.38%	0.42%	2.59%	-0.76%	3.35%
163	31/05/2013	-0.17%	0.07%	-0.24%	0.25%	0.14%	0.11%
164	04/12/2013	1.37%	-0.69%	2.06%	4.13%	-1.39%	5.52%
165	11/06/2014	2.08%	0.06%	2.02%	2.28%	0.11%	2.17%
166	27/11/2014	-6.40%	-1.11%	-5.29%	-9.52%	-2.22%	-7.30%
Average		-0.35%		-0.40%	-1.05%		-1.17%
ST DEV		4.39%		3.99%	5.82%		5.12%
P-value		0.65		0.57	0.31		0.20

OPEC Meetings	Date	% Δ in Actual Price -5 +5	% Δ in Expected Price -5 +5	% Δ in Abnormal Price -5 +5	% Δ in Actual Price -10 +10	% Δ in Expected Price -10 +10	% Δ in Abnormal Price -10 +10
134	30/01/2005	-6.71%	2.31%	-9.02%	-1.87%	4.61%	-6.48%
135	16/03/2005	-9.72%	2.39%	-12.11%	4.36%	4.77%	-0.41%
136	15/06/2005	10.97%	0.11%	10.86%	5.20%	0.22%	4.98%
137	20/09/2005	2.79%	5.02%	-2.23%	-3.17%	10.03%	-13.20%
138	12/12/2005	-4.34%	-2.51%	-1.83%	1.39%	-5.02%	6.41%
139	31/01/2006	-5.72%	3.17%	-8.89%	-10.17%	6.34%	-16.51%
140	08/03/2006	0.16%	-1.13%	1.29%	1.69%	-2.26%	3.95%
141	01/06/2006	1.12%	2.14%	-1.02%	1.65%	4.29%	-2.64%
142	11/09/2006	-7.80%	-2.11%	-5.69%	-15.79%	-4.21%	-11.58%
143	14/12/2006	-0.78%	2.25%	-3.03%	-3.37%	4.49%	-7.86%
144	15/03/2007	-2.45%	6.03%	-8.48%	6.66%	12.06%	-5.40%
145	11/09/2007	8.58%	-1.25%	9.83%	12.81%	-2.50%	15.31%
146	05/12/2007	4.08%	6.53%	-2.45%	-4.84%	13.07%	-17.91%
147	01/02/2008	1.55%	1.15%	0.40%	6.06%	2.30%	3.76%
148	05/03/2008	10.31%	1.91%	8.40%	2.37%	3.81%	-1.44%
149	10/09/2008	-10.96%	-6.20%	-4.76%	-8.14%	-12.41%	4.27%
150	24/10/2008	-5.29%	-8.51%	3.22%	-21.15%	-17.02%	-4.13%
151	17/12/2008	-23.57%	-14.12%	-9.45%	-1.33%	-28.25%	26.92%
152	15/03/2009	12.85%	9.12%	3.73%	21.01%	18.24%	2.77%
153	28/06/2009	-6.28%	11.47%	-17.75%	-15.48%	22.95%	-38.43%
154	10/09/2009	6.54%	5.56%	0.98%	-7.90%	11.13%	-19.03%
155	22/12/2009	12.36%	-1.94%	14.30%	13.79%	-3.88%	17.67%
156	17/03/2010	-2.17%	0.48%	-2.65%	3.14%	0.97%	2.17%
157	14/10/2010	-1.61%	1.25%	-2.86%	2.81%	2.50%	0.31%
158	11/12/2010	-0.73%	1.26%	-1.99%	6.71%	2.53%	4.18%
159	08/06/2011	-5.45%	-3.82%	-1.63%	-4.21%	-7.63%	3.42%
160	14/12/2011	-1.90%	4.39%	-6.29%	-0.68%	8.79%	-9.47%
161	14/06/2012	-8.10%	-5.30%	-2.80%	-10.17%	-10.59%	0.42%
162	12/12/2012	1.98%	-1.89%	3.87%	5.59%	-3.78%	9.37%
163	31/05/2013	2.15%	0.36%	1.79%	3.14%	0.72%	2.42%
164	04/12/2013	4.11%	-3.47%	7.58%	4.54%	-6.94%	11.48%
165	11/06/2014	3.26%	0.28%	2.98%	3.55%	0.55%	3.00%
166	27/11/2014	-12.88%	-5.56%	-7.32%	-22.02%	-11.12%	-10.90%
	Average	-1.02%		-1.30%	-0.72%		-1.29%
	ST DEV	7.84%		6.92%	9.49%		12.14%
	P-value	0.46		0.91	0.67		0.55

Appendix G: Oil Price Movements

Oil Price movements around the time of OPEC announcements after the removal of the outliers; OPEC 151st and 166th meetings

NB: *-1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=31*

OPEC Meetings	Date	% Δ Actual Price -1 +1	% Δ Expected Price -1 +1	% Δ Abnormal Price +1 -1	% Δ Actual Price -2 +2	% Δ Expected Price -2 +2	% Δ Abnormal Price -2 +2
134	30/01/2005	-0.11%	0.46%	-0.57%	-4.41%	0.92%	-5.33%
135	16/03/2005	2.45%	0.48%	1.97%	3.46%	0.95%	2.51%
136	15/06/2005	2.63%	0.02%	2.61%	5.28%	0.04%	5.24%
137	20/09/2005	-0.37%	1.00%	-1.37%	6.61%	2.01%	4.60%
138	12/12/2005	3.28%	-0.50%	3.78%	0.32%	-1.00%	1.32%
139	31/01/2006	-2.56%	0.63%	-3.19%	-4.57%	1.27%	-5.84%
140	08/03/2006	-1.63%	-0.23%	-1.40%	-4.08%	-0.45%	-3.63%
141	01/06/2006	1.83%	0.43%	1.40%	0.90%	0.86%	0.04%
142	11/09/2006	-3.76%	-0.42%	-3.34%	-4.87%	-0.84%	-4.03%
143	14/12/2006	3.36%	0.45%	2.91%	1.85%	0.90%	0.95%
144	15/03/2007	-1.87%	1.21%	-3.08%	-2.38%	2.41%	-4.79%
145	11/09/2007	2.99%	-0.25%	3.24%	4.37%	-0.50%	4.87%
146	05/12/2007	2.20%	1.31%	0.89%	-1.19%	2.61%	-3.80%
147	01/02/2008	-1.75%	0.23%	-1.98%	-4.35%	0.46%	-4.81%
148	05/03/2008	5.81%	0.38%	5.43%	2.64%	0.76%	1.88%
149	10/09/2008	-2.21%	-1.24%	-0.97%	-4.85%	-2.48%	-2.37%
150	24/10/2008	-7.82%	-1.70%	-6.12%	-6.16%	-3.40%	-2.76%
151	17/12/2008						
152	15/03/2009	5.95%	1.82%	4.13%	2.58%	3.65%	-1.07%
153	28/06/2009	0.95%	2.29%	-1.34%	-0.55%	4.59%	-5.14%
154	10/09/2009	-2.71%	1.11%	-3.82%	-3.12%	2.23%	-5.35%
155	22/12/2009	4.57%	-0.39%	4.96%	4.82%	-0.78%	5.60%
156	17/03/2010	0.50%	0.10%	0.40%	0.99%	0.19%	0.80%
157	14/10/2010	-2.17%	0.25%	-2.42%	1.70%	0.50%	1.20%
158	11/12/2010	0.59%	0.25%	0.34%	0.35%	0.51%	-0.16%
159	08/06/2011	2.79%	-0.76%	3.55%	0.23%	-1.53%	1.76%
160	14/12/2011	-6.83%	0.88%	-7.71%	-4.32%	1.76%	-6.08%
161	14/06/2012	1.79%	-1.06%	2.85%	-0.11%	-2.12%	2.01%
162	12/12/2012	0.04%	-0.38%	0.42%	2.59%	-0.76%	3.35%
163	31/05/2013	-0.17%	0.07%	-0.24%	0.25%	0.14%	0.11%
164	04/12/2013	1.37%	-0.69%	2.06%	4.13%	-1.39%	5.52%
165	11/06/2014	2.08%	0.06%	2.02%	2.28%	0.11%	2.17%
166	27/11/2014						
	Average	0.36%		0.17%	0.01%		-0.36%
	ST DEV	3.22%		3.19%	3.53%		3.77%
	P-value	0.54		0.77	0.99		0.60

OPEC Meetings	Date	% Δ Actual Price -5 +5	% Δ Expected Price -5 +5	% Δ Abnormal Price -5 +5	% Δ Actual Price -10 +10	% Δ Expected Price -10 +10	% Δ Abnormal Price -10 +10
134	30/01/2005	-6.71%	2.31%	-9.02%	-1.87%	4.61%	-6.48%
135	16/03/2005	-9.72%	2.39%	-12.11%	4.36%	4.77%	-0.41%
136	15/06/2005	10.97%	0.11%	10.86%	5.20%	0.22%	4.98%
137	20/09/2005	2.79%	5.02%	-2.23%	-3.17%	10.03%	-13.20%
138	12/12/2005	-4.34%	-2.51%	-1.83%	1.39%	-5.02%	6.41%
139	31/01/2006	-5.72%	3.17%	-8.89%	-10.17%	6.34%	-16.51%
140	08/03/2006	0.16%	-1.13%	1.29%	1.69%	-2.26%	3.95%
141	01/06/2006	1.12%	2.14%	-1.02%	1.65%	4.29%	-2.64%
142	11/09/2006	-7.80%	-2.11%	-5.69%	-15.79%	-4.21%	-11.58%
143	14/12/2006	-0.78%	2.25%	-3.03%	-3.37%	4.49%	-7.86%
144	15/03/2007	-2.45%	6.03%	-8.48%	6.66%	12.06%	-5.40%
145	11/09/2007	8.58%	-1.25%	9.83%	12.81%	-2.50%	15.31%
146	05/12/2007	4.08%	6.53%	-2.45%	-4.84%	13.07%	-17.91%
147	01/02/2008	1.55%	1.15%	0.40%	6.06%	2.30%	3.76%
148	05/03/2008	10.31%	1.91%	8.40%	2.37%	3.81%	-1.44%
149	10/09/2008	-10.96%	-6.20%	-4.76%	-8.14%	-12.41%	4.27%
150	24/10/2008	-5.29%	-8.51%	3.22%	-21.15%	-17.02%	-4.13%
151	17/12/2008						
152	15/03/2009	12.85%	9.12%	3.73%	21.01%	18.24%	2.77%
153	28/06/2009	-6.28%	11.47%	-17.75%	-15.48%	22.95%	-38.43%
154	10/09/2009	6.54%	5.56%	0.98%	-7.90%	11.13%	-19.03%
155	22/12/2009	12.36%	-1.94%	14.30%	13.79%	-3.88%	17.67%
156	17/03/2010	-2.17%	0.48%	-2.65%	3.14%	0.97%	2.17%
157	14/10/2010	-1.61%	1.25%	-2.86%	2.81%	2.50%	0.31%
158	11/12/2010	-0.73%	1.26%	-1.99%	6.71%	2.53%	4.18%
159	08/06/2011	-5.45%	-3.82%	-1.63%	-4.21%	-7.63%	3.42%
160	14/12/2011	-1.90%	4.39%	-6.29%	-0.68%	8.79%	-9.47%
161	14/06/2012	-8.10%	-5.30%	-2.80%	-10.17%	-10.59%	0.42%
162	12/12/2012	1.98%	-1.89%	3.87%	5.59%	-3.78%	9.37%
163	31/05/2013	2.15%	0.36%	1.79%	3.14%	0.72%	2.42%
164	04/12/2013	4.11%	-3.47%	7.58%	4.54%	-6.94%	11.48%
165	11/06/2014	3.26%	0.28%	2.98%	3.55%	0.55%	3.00%
166	27/11/2014						
	Average	0.09%		-0.85%	-0.02%		-1.89%
	ST DEV	6.53%		6.88%	8.97%		11.28%
	P-value	0.94		0.50	0.99		0.36

Appendix H: Unchanged Production Quotas

Oil price movements when OPEC decision is to leave production quotas unchanged. There are twenty-two times when OPEC decided to leave the quotas unchanged.

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=22

OPEC Meetings	Date	% Δ in Actual Price -1 +1	% Δ in Expected Price -1 +1	% Δ in Abnormal Price -1 +1	% Δ in Actual Price -2 +2	% Δ in Expected Price -2 +2	% Δ in Abnormal Price -2 +2
137	20/09/2005	-0.37%	1.00%	-1.37%	6.61%	2.01%	4.60%
140	08/03/2006	-1.63%	-0.23%	-1.40%	-4.08%	-0.45%	-3.63%
141	01/06/2006	1.83%	0.43%	1.40%	0.90%	0.86%	0.04%
142	11/09/2006	-3.76%	-0.42%	-3.34%	-4.87%	-0.84%	-4.03%
144	15/03/2007	-1.87%	1.21%	-3.08%	-2.38%	2.41%	-4.79%
146	05/12/2007	2.20%	1.31%	0.89%	-1.19%	2.61%	-3.80%
147	01/02/2008	-1.75%	0.23%	-1.98%	-4.35%	0.46%	-4.81%
148	05/03/2008	5.81%	0.38%	5.43%	2.64%	0.76%	1.88%
152	15/03/2009	5.95%	1.82%	4.13%	2.58%	3.65%	-1.07%
153	28/06/2009	0.95%	2.29%	-1.34%	-0.55%	4.59%	-5.14%
154	10/09/2009	-2.71%	1.11%	-3.82%	-3.12%	2.23%	-5.35%
155	22/12/2009	4.57%	-0.39%	4.96%	4.82%	-0.78%	5.60%
156	17/03/2010	0.50%	0.10%	0.40%	0.99%	0.19%	0.80%
157	14/10/2010	-2.17%	0.25%	-2.42%	1.70%	0.50%	1.20%
158	11/12/2010	0.59%	0.25%	0.34%	0.35%	0.51%	-0.16%
160	14/12/2011	-6.83%	0.88%	-7.71%	-4.32%	1.76%	-6.08%
161	14/06/2012	1.79%	-1.06%	2.85%	-0.11%	-2.12%	2.01%
162	12/12/2012	0.04%	-0.38%	0.42%	2.59%	-0.76%	3.35%
163	31/05/2013	-0.17%	0.07%	-0.24%	0.25%	0.14%	0.11%
164	04/12/2013	1.37%	-0.69%	2.06%	4.13%	-1.39%	5.52%
165	11/06/2014	2.08%	0.06%	2.02%	2.28%	0.11%	2.17%
166	27/11/2014	-6.40%	-1.11%	-5.29%	-9.52%	-2.22%	-7.30%
Average		0.00%		-0.32%	-0.21%		-0.86%
ST DEV		3.33%		3.29%	3.77%		3.96%
P-value		0.58		0.65	0.80		0.32

Appendix I: Increase in Production Quotas

Oil price movements when OPEC decision is to increase production quotas. On six occasions OPEC decided to increase production quotas.

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=6

OPEC Meetings	Date	% Δ in Actual Price -1 +1	% Δ in Expected Price -1 +1	% Δ in Abnormal Price +1 - 1	% Δ in Actual Price -2 +2	% Δ in Expected Price -2 +2	% Δ in Abnormal Price -2 +2
135	16/03/2005	2.45%	0.48%	1.97%	3.46%	0.95%	2.51%
136	15/06/2005	2.63%	0.02%	2.61%	5.28%	0.04%	5.24%
138	12/12/2005	3.28%	-0.50%	3.78%	0.32%	-1.00%	1.32%
145	11/09/2007	2.99%	-0.25%	3.24%	4.37%	-0.50%	4.87%
149	10/09/2008	-2.21%	-1.24%	0.97%	-4.85%	-2.48%	-2.37%
159	08/06/2011	2.79%	-0.76%	3.55%	0.23%	-1.53%	1.76%
	Average	1.99%		2.69%	1.47%		2.22%
	ST DEV	2.08%		1.07%	3.73%		2.77%
	P-value	0.07		0.00	0.38		0.11

OPEC Meetings	Date	% Δ in Actual Price -5 +5	% Δ in Expected Price -5 +5	% Δ in Abnormal Price +5 -5	% Δ in Actual Price -10 +10	% Δ in Expected Price -10 +10	% Δ in Abnormal Price -10 +10
135	16/03/2005	-9.72%	2.39%	-12.11%	4.36%	4.77%	-0.41%
136	15/06/2005	10.97%	0.11%	10.86%	5.20%	0.22%	4.98%
138	12/12/2005	-4.34%	-2.51%	-1.83%	1.39%	-5.02%	6.41%
145	11/09/2007	8.58%	-1.25%	9.83%	12.81%	-2.50%	15.31%
149	10/09/2008	-10.96%	-6.20%	4.76%	-8.14%	-12.41%	4.27%
159	08/06/2011	-5.45%	-3.82%	-1.63%	-4.21%	-7.63%	3.42%
	Average	-1.82%		1.65%	1.90%		5.66%
	ST DEV	9.35%		8.64%	7.41%		5.25%
	P-value	0.65		0.66	0.56		0.05

Appendix J: Cut in Production Quota

Oil price movements when OPEC decision is to cut production quotas. There are four instances when OPEC decided to cut production quotas.

NB: *-1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=4*

OPEC Meetings	Date	% Δ in Actual Price -1 +1	% Δ in Expected Price -1 +1	% Δ in Abnormal Price +1 -1	% Δ in Actual Price -2 +2	% Δ in Expected Price -2 +2	% Δ in Abnormal Price -2 +2
139	31/01/2006	-2.56%	0.63%	-3.19%	-4.57%	1.27%	-5.84%
143	14/12/2006	3.36%	0.45%	2.91%	1.85%	0.90%	0.95%
150	24/10/2008	-7.82%	-1.70%	-6.12%	-6.16%	-3.40%	-2.76%
151	17/12/2008	-16.22%	-2.82%	-13.40%	-25.64%	-5.65%	-19.99%
	Average	-5.81%		-4.95%	-8.63%		-6.91%
	ST DEV	8.31%		6.77%	11.86%		9.15%
	P-value	0.26		0.24	0.23		0.23

OPEC Meetings	Date	% Δ in Actual Price -5 +5	% Δ in Expected Price -5 +5	% Δ in Abnormal Price +5 -5	% Δ in Actual Price -10 +10	% Δ in Expected Price -10 +10	% Δ in Abnormal Price -10 +10
139	31/01/2006	-5.72%	3.17%	-8.89%	-10.17%	6.34%	-16.51%
143	14/12/2006	-0.78%	2.25%	-3.03%	-3.37%	4.49%	-7.86%
150	24/10/2008	-5.29%	-8.51%	3.22%	-21.15%	-17.02%	-4.13%
151	17/12/2008	-23.57%	-14.12%	-9.45%	-1.33%	-28.25%	26.92%
	Average	-8.84%		-4.54%	-9.01%		-0.40%
	ST DEV	10.07%		5.93%	8.94%		18.93%
	P-value	0.18		0.22	0.14		0.97

Appendix K: Market Expectations

Meetings	Dates	Production Quotas prior to the announcements	Announced Production Quotas Decisions	Outcome	Market Expectations	Ability of Market to predict
134	30/01/2005	27	27	UNCHANGE	UNCHANGE	Correct
135	16/03/2005	27	27.5	INCREASE	INCREASE	Correct
136	15/06/2005	27.5	28	INCREASE	INCREASE	Correct
137	20/09/2005	28	28	UNCHANGE	INCREASE	Wrong
138	12/12/2005	28	30	INCREASE	INCREASE	Correct
139	31/01/2006	30	28	DECREASE	UNCHANGE	Wrong
140	08/03/2006	28	28	UNCHANGE	INCREASE	Wrong
141	01/06/2006	28	28	UNCHANGE	UNCHANGE	Correct
142	11/09/2006	28	28	UNCHANGE	UNCHANGE	Correct
143	14/12/2006	28	27.5	DECREASE	DECREASE	Correct
144	15/03/2007	27.5	27.5	UNCHANGE	UNCHANGE	Correct
145	11/09/2007	27.5	28	INCREASE	UNCHANGE	Wrong
146	05/12/2007	28	28	UNCHANGE	INCREASE	Wrong
147	01/02/2008	28	28	UNCHANGE	UNCHANGE	Correct
148	05/03/2008	28	28	UNCHANGE	UNCHANGE	Correct
149	10/09/2008	28	28.8	INCREASE	DECREASE	Wrong
150	24/10/2008	28.8	27.3	DECREASE	DECREASE	Correct
151	17/12/2008	27.3	24.8	DECREASE	DECREASE	Correct
152	15/03/2009	24.8	24.8	UNCHANGE	DECREASE	Wrong
153	28/05/2009	24.8	24.8	UNCHANGE	UNCHANGE	Correct
154	10/09/2009	24.8	24.8	UNCHANGE	UNCHANGE	Correct
155	22/12/2009	24.8	24.8	UNCHANGE	UNCHANGE	Correct
156	17/03/2010	24.8	24.8	UNCHANGE	UNCHANGE	Correct
157	14/10/2010	24.8	24.8	UNCHANGE	UNCHANGE	Correct
158	11/12/2010	24.8	24.8	UNCHANGE	UNCHANGE	Correct
159	08/06/2011	24.8	30	INCREASE	INCREASE	Correct
160	14/12/2011	30	30	UNCHANGE	UNCHANGE	Correct
161	16/06/2012	30	30	UNCHANGE	UNCHANGE	Correct
162	12/12/2012	30	30	UNCHANGE	UNCHANGE	Correct
163	31/05/2013	30	30	UNCHANGE	UNCHANGE	Correct
164	04/12/2013	30	30	UNCHANGE	DECREASE	Wrong
165	11/06/2014	30	30	UNCHANGE	INCREASE	Wrong
166	27/11/2014	30	30	UNCHANGE	DECREASE	Wrong

Appendix L: Sources of Market Expectations

Market expectations prior to the OPEC announcements

Dates	Source	Headlines
30/01/2005	FT - 19/01/2005	IEA presses Opec to maintain output
16/03/2005	FT - 14/03/2005	Opec to continue pumping above quota
15/06/2005	FT - 07/06/2005	Crude prices down as Opec eases supply fears
20/09/2005	FT - 12/09/2005	Brown will urge Opec to boost supply
12/12/2005	FT - 10/12/2005	Opec to pump all it can despite falling price
31/01/2006	FT - 24/01/2006	Saudi oil minister helps allay output gap fears
08/03/2006	FT - 06/03/2006	Prospect of Opec output cut recedes amid political unrest
01/06/2006	FT - 24/05/2006	Traders remain cautious amid strong recovery
11/09/2006	BBC - 07/09/2006	Oil prices ease to five-month low
14/12/2006	FT - 11/12/2006	Opec prepares to put the squeeze on world stockpiles of oil:
15/03/2007	FT - 13/03/2007	Oil prices dip below Dollars 60 ahead of Opec meeting
11/09/2007	FT - 08/09/2007	Concerns over Opec output drive oil prices
05/12/2007	FT - 28/11/2007	Opec to discuss rise in output
01/02/2008	FT - 31/01/2008	Opec leans towards inaction amid economy fears
05/03/2008	FT - 04/03/2008	Oil record unlikely to change Opec view
10/09/2008	FT - 08/09/2008	Opec ponders when to put brake on oil output
24/10/2008	FT -22/10/2008	Divided Opec wrestles with level of output cut
17/12/2008	FT - 12/12/2008	Opec needs to make big cut in production, say ministers
15/03/2009	FT - 14/03/2009	Opec in driving seat as forecast of oil output by outsiders is cut
28/05/2009	FT - 26/05/2009	Market cautious ahead of Opec meeting
10/09/2009	FT - 02/09/2009	Commodities at month low after crude falls
22/12/2009	FT - 01/09/2009	Indian growth data support raw materials
17/03/2010	FT - 16/03/2010	Perfect' oil price hides divisions within Opec
14/10/2010	FT -13/10/2010	Baghdad and Tehran jostle for power in Opec
11/12/2010	FT -10/12/2010	Oil price rise puts pressure on Opec ahead of meeting
08/06/2011	FT - 03/06/2011	Opec eyes first quota rise in years
14/12/2011	FT - 13/12/2011	Traders bet on price collapse and super-spike
16/06/2012	FT -13/06/2012	Saudi call for oil output rise stirs up Opec meeting
12/12/2012	FT - 12/12/2012	Saudi Arabia cuts oil output amid fracking surge in US
31/05/2013	FT - 29/05/2013	Upbeat Riyadh seen pushing for Opec quota status quo
04/12/2013	FT - 02/12/2003	The cartel's challenge: Oil supply
11/06/2014	FT - 06/06/2012	Opec faces up to huge oil supply challenge: News analysis
27/11/2014	FT - 24/11/2014	A new chapter for Opec?

Appendix M: Correct Market Expectations

Oil price movements when market correctly predicts the decision OPEC will make at the end of its Meetings.

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=23

OPEC Announcements	% Δ in Actual price -1 +1	% Δ in Expected price -1 +1	% Δ in Abnormal price -1 +1	% Δ in Actual price -2 +2	% Δ in Expected price -2 +2	% Δ in Abnormal price -2 +2
Increase 4	2.45%	0.48%	1.97%	3.46%	0.95%	2.51%
Increase 4	2.63%	0.02%	2.61%	5.28%	0.04%	5.24%
Increase 4	3.28%	-0.50%	3.78%	0.32%	-1.00%	1.32%
Increase 4	2.79%	-0.76%	3.55%	0.23%	-1.53%	1.76%
Maintain 16	-0.11%	0.46%	-0.57%	-4.41%	0.92%	-5.33%
Maintain 16	1.83%	0.43%	1.40%	0.90%	0.86%	0.04%
Maintain 16	-3.76%	-0.42%	-3.34%	-4.87%	-0.84%	-4.03%
Maintain 16	-1.87%	1.22%	-3.09%	-2.38%	2.41%	-4.79%
Maintain 16	-1.75%	0.23%	-1.98%	-4.35%	0.46%	-4.81%
Maintain 16	5.81%	0.38%	5.43%	2.64%	0.76%	1.88%
Maintain 16	0.95%	2.29%	-1.34%	-0.55%	4.59%	-5.14%
Maintain 16	-2.71%	1.11%	-3.82%	-3.12%	2.23%	-5.35%
Maintain 16	4.57%	-0.39%	4.96%	4.82%	-0.78%	5.60%
Maintain 16	0.50%	0.10%	0.40%	0.99%	0.19%	0.80%
Maintain 16	-2.17%	0.25%	-2.42%	1.70%	0.50%	1.20%
Maintain 16	0.59%	0.25%	0.34%	0.35%	0.51%	-0.16%
Maintain 16	-6.83%	0.88%	-7.71%	-4.32%	1.76%	-6.08%
Maintain 16	1.79%	-1.06%	2.85%	-0.11%	-2.12%	2.01%
Maintain 16	0.04%	-0.38%	0.42%	2.59%	-0.76%	3.35%
Maintain 16	-0.17%	0.07%	-0.24%	0.25%	0.14%	0.11%
Decrease 3	3.36%	0.45%	2.91%	1.85%	0.90%	0.95%
Decrease 3	-7.82%	1.70%	-9.52%	-6.16%	-3.40%	-2.76%
Decrease 3	-16.22%	-2.82%	-13.40%	-25.64%	-5.65%	-19.99%
Average	-0.56%		-0.73%	-1.33%		-1.38%
ST DEV	4.78%		4.65%	6.17%		5.39%
P-value	0.58		0.46	0.31		0.23

OPEC Announcements	% Δ in Actual price -5 +5	% Δ in Expected price -5 +5	% Δ in Abnormal price -5 +5	% Δ in Actual price -10 +10	% Δ in Expected price -10 +10	% Δ in Abnormal price -10 +10
Increase 4	-9.72%	2.39%	-12.11%	4.36%	4.77%	-0.41%
Increase 4	10.97%	0.11%	10.86%	5.20%	0.22%	4.98%
Increase 4	-4.34%	-2.51%	-1.83%	1.39%	-5.02%	6.41%
Increase 4	-5.45%	-3.82%	-1.63%	-4.21%	-7.63%	3.42%
Maintain 16	-6.71%	2.31%	-9.02%	-1.87%	4.16%	-6.03%
Maintain 16	1.12%	2.14%	-1.02%	1.65%	4.29%	-2.64%
Maintain 16	-7.80%	-2.11%	-5.69%	-15.79%	-4.21%	-11.58%
Maintain 16	-2.45%	6.03%	-8.48%	6.66%	12.06%	-5.40%
Maintain 16	1.55%	1.15%	0.40%	6.06%	2.30%	3.76%
Maintain 16	10.31%	1.91%	8.40%	2.37%	3.81%	-1.44%
Maintain 16	-6.28%	11.47%	-17.75%	-15.48%	22.95%	-38.43%
Maintain 16	6.54%	5.56%	0.98%	-7.90%	11.13%	-19.03%
Maintain 16	12.36%	-1.94%	14.30%	13.79%	-3.88%	17.67%
Maintain 16	-2.17%	0.48%	-2.65%	3.14%	0.97%	2.17%
Maintain 16	-1.61%	1.25%	-2.86%	2.81%	2.50%	0.31%
Maintain 16	-0.73%	1.26%	-1.99%	6.71%	2.53%	4.18%
Maintain 16	-1.90%	4.39%	-6.29%	-0.68%	8.79%	-9.47%
Maintain 16	-8.10%	-5.30%	-2.80%	-10.17%	-10.59%	0.42%
Maintain 16	1.98%	-1.89%	3.87%	5.59%	-3.78%	9.37%
Maintain 16	2.15%	0.36%	1.79%	3.14%	0.72%	2.42%
Decrease 3	-0.78%	2.25%	-3.03%	-3.37%	4.49%	-7.86%
Decrease 3	-5.29%	-8.51%	3.22%	-21.15%	-17.02%	-4.13%
Decrease 3	-23.57%	-14.12%	-9.45%	-1.33%	-28.25%	26.92%
Average	-1.74%		-1.86%	-0.83%		-1.06%
ST DEV	7.75%		7.27%	8.40%		12.50%
P-value	0.29		0.23	0.64		0.69

Appendix N: Correct Market Expectations

Oil price movements when market correctly predicts the decision OPEC will make at the end of its Meetings after the removal of outlier; OPEC meeting 151st

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=22

OPEC Announcements	% Δ in Actual price -1 +1	% Δ in Expected price -1 +1	% Δ in Abnormal price -1 +1	% Δ in Actual price -2 +2	% Δ in Expected price -2 +2	% Δ in Abnormal price -2 +2
Increase 4	2.45%	0.48%	1.97%	3.46%	0.95%	2.51%
Increase 4	2.63%	0.02%	2.61%	5.28%	0.04%	5.24%
Increase 4	3.28%	-0.50%	3.78%	0.32%	-1.00%	1.32%
Increase 4	2.79%	-0.76%	3.55%	0.23%	-1.53%	1.76%
Maintain 16	-0.11%	0.46%	-0.57%	-4.41%	0.92%	-5.33%
Maintain 16	1.83%	0.43%	1.40%	0.90%	0.86%	0.04%
Maintain 16	-3.76%	-0.42%	-3.34%	-4.87%	-0.84%	-4.03%
Maintain 16	-1.87%	1.22%	-3.09%	-2.38%	2.41%	-4.79%
Maintain 16	-1.75%	0.23%	-1.98%	-4.35%	0.46%	-4.81%
Maintain 16	5.81%	0.38%	5.43%	2.64%	0.76%	1.88%
Maintain 16	0.95%	2.29%	-1.34%	-0.55%	4.59%	-5.14%
Maintain 16	-2.71%	1.11%	-3.82%	-3.12%	2.23%	-5.35%
Maintain 16	4.57%	-0.39%	4.96%	4.82%	-0.78%	5.60%
Maintain 16	0.50%	0.10%	0.40%	0.99%	0.19%	0.80%
Maintain 16	-2.17%	0.25%	-2.42%	1.70%	0.50%	1.20%
Maintain 16	0.59%	0.25%	0.34%	0.35%	0.51%	-0.16%
Maintain 16	-6.83%	0.88%	-7.71%	-4.32%	1.76%	-6.08%
Maintain 16	1.79%	-1.06%	2.85%	-0.11%	-2.12%	2.01%
Maintain 16	0.04%	-0.38%	0.42%	2.59%	-0.76%	3.35%
Maintain 16	-0.17%	0.07%	-0.24%	0.25%	0.14%	0.11%
Decrease 3	3.36%	0.45%	2.91%	1.85%	0.90%	0.95%
Decrease 3	-7.82%	1.70%	-9.52%	-6.16%	-3.40%	-2.76%
Decrease 3						
Average	0.15%		-0.16%	-0.22%		-0.53%
ST DEV	3.42%		3.83%	3.23%		3.62%
P-value	0.84		0.85	0.75		0.50

OPEC Announcements	% Δ in Actual price -5 +5	% Δ in Expected price -5 +5	% Δ in Abnormal price -5 +5	% Δ in Actual price - 10 +10	% Δ in Expected price -10 +10	% Δ in Abnormal price -10 +10
Increase 4	-9.72%	2.39%	-12.11%	4.36%	4.77%	-0.41%
Increase 4	10.97%	0.11%	10.86%	5.20%	0.22%	4.98%
Increase 4	-4.34%	-2.51%	-1.83%	1.39%	-5.02%	6.41%
Increase 4	-5.45%	-3.82%	-1.63%	-4.21%	-7.63%	3.42%
Maintain 16	-6.71%	2.31%	-9.02%	-1.87%	4.16%	-6.03%
Maintain 16	1.12%	2.14%	-1.02%	1.65%	4.29%	-2.64%
Maintain 16	-7.80%	-2.11%	-5.69%	-15.79%	-4.21%	-11.58%
Maintain 16	-2.45%	6.03%	-8.48%	6.66%	12.06%	-5.40%
Maintain 16	1.55%	1.15%	0.40%	6.06%	2.30%	3.76%
Maintain 16	10.31%	1.91%	8.40%	2.37%	3.81%	-1.44%
Maintain 16	-6.28%	11.47%	-17.75%	-15.48%	22.95%	-38.43%
Maintain 16	6.54%	5.56%	0.98%	-7.90%	11.13%	-19.03%
Maintain 16	12.36%	-1.94%	14.30%	13.79%	-3.88%	17.67%
Maintain 16	-2.17%	0.48%	-2.65%	3.14%	0.97%	2.17%
Maintain 16	-1.61%	1.25%	-2.86%	2.81%	2.50%	0.31%
Maintain 16	-0.73%	1.26%	-1.99%	6.71%	2.53%	4.18%
Maintain 16	-1.90%	4.39%	-6.29%	-0.68%	8.79%	-9.47%
Maintain 16	-8.10%	-5.30%	-2.80%	-10.17%	-10.59%	0.42%
Maintain 16	1.98%	-1.89%	3.87%	5.59%	-3.78%	9.37%
Maintain 16	2.15%	0.36%	1.79%	3.14%	0.72%	2.42%
Decrease 3	-0.78%	2.25%	-3.03%	-3.37%	4.49%	-7.86%
Decrease 3	-5.29%	-8.51%	3.22%	-21.15%	-17.02%	-4.13%
Decrease 3						
Average	-0.74%		-1.52%	-0.81%		-2.33%
ST DEV	6.26%		7.25%	8.60%		11.16%
P-value	0.59		0.34	0.66		0.34

Appendix O: Incorrect Market Expectations

Oil price movements when market wrongly predicts the decision OPEC will make at the end of its Meetings.

NB: *-1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC meeting, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=10*

OPEC Meetings	% Δ in Actual price -1 +1	% Δ in Expected price -1 +1	% Δ in Abnormal price -1 +1	% Δ in Actual price -2 +2	% Δ in Expected price -2 +2	% Δ in Abnormal price -2 +2
137	-0.37%	1.00%	-1.37%	6.61%	2.01%	4.60%
139	-2.56%	0.63%	-3.19%	-4.57%	1.27%	-5.84%
140	-1.63%	-0.23%	-1.40%	-4.08%	-0.45%	-3.63%
145	2.99%	-0.25%	3.24%	4.37%	-0.50%	4.87%
146	2.20%	1.31%	0.89%	-1.19%	2.61%	-3.80%
149	-2.21%	-1.24%	-0.97%	-4.85%	-2.48%	-2.37%
152	5.95%	1.82%	4.13%	2.58%	3.65%	-1.07%
164	1.37%	-0.69%	2.06%	4.13%	-1.39%	5.52%
165	2.08%	0.06%	2.02%	2.28%	0.11%	2.17%
166	-6.40%	-1.11%	-5.29%	-9.52%	-2.22%	-7.30%
Average	0.14%		0.01%	-0.42%		-0.69%
ST DEV	0.04		0.03	0.052		0.047
P-value	1.53E-06		0.32	7.34E-10		8.70E-12

OPEC Meetings	% Δ in Actual price -5 +5	% Δ in Expected price -5 +5	% Δ in Abnormal price -5 +5	% Δ in Actual price -10 +10	% Δ in Expected price -10 +10	% Δ in Abnormal price -10 +10
137	2.79%	5.02%	-2.23%	-3.17%	10.03%	-13.20%
139	-5.72%	3.17%	-8.89%	-10.17%	6.34%	-16.51%
140	0.16%	-1.13%	1.29%	1.69%	-2.26%	3.95%
145	8.58%	-1.25%	9.83%	12.81%	-2.50%	15.31%
146	4.08%	6.53%	-2.45%	-4.84%	13.07%	-17.91%
149	-10.96%	-6.20%	-4.76%	-8.14%	-12.41%	4.27%
152	12.85%	9.12%	3.73%	21.01%	18.24%	2.77%
164	4.11%	-3.47%	7.58%	4.54%	-6.94%	11.48%
165	3.26%	0.28%	2.98%	3.55%	0.55%	3.00%
166	-12.88%	-5.56%	-7.32%	-22.02%	-11.12%	-10.90%
Average	0.63%		-0.02%	-0.47%		-1.77%
ST DEV	0.082		0.062	0.121		0.119
P-value	1.30E-09		0.32	5.88E-07		4.79E-12

Appendix P: Incorrect Market Expectations

Oil price movements when market wrongly predicts the decision OPEC will make at the end of its Meetings after the removal of outlier; OPEC 166th meeting

NB: -1 +1 signifies a day before and a day after OPEC announcement, -2 +2 signifies two days before and two days after OPEC announcement, -5 +5 signifies five days before and five days after OPEC announcement, while -10 +10 signifies ten days before and ten days after OPEC announcement. N=9

OPEC Meetings	% Δ in Actual price -1 +1	% Δ in Expected price -1 +1	% Δ in Abnormal price -1 +1	% Δ in Actual price -2 +2	% Δ in Expected price -2 +2	% Δ in Abnormal price -2 +2
137	-0.37%	1.00%	-1.37%	6.61%	2.01%	4.60%
139	-2.56%	0.63%	-3.19%	-4.57%	1.27%	-5.84%
140	-1.63%	-0.23%	-1.40%	-4.08%	-0.45%	-3.63%
145	2.99%	-0.25%	3.24%	4.37%	-0.50%	4.87%
146	2.20%	1.31%	0.89%	-1.19%	2.61%	-3.80%
149	-2.21%	-1.24%	-0.97%	-4.85%	-2.48%	-2.37%
152	5.95%	1.82%	4.13%	2.58%	3.65%	-1.07%
164	1.37%	-0.69%	2.06%	4.13%	-1.39%	5.52%
165	2.08%	0.06%	2.02%	2.28%	0.11%	2.17%
166						
Average	0.87%		0.60%	0.59%		0.05%
ST DEV	2.80%		2.46%	4.35%		4.31%
P-value	0.38		0.49	0.69		0.74

OPEC Meetings	% Δ in Actual price -5 +5	% Δ in Expected price -5 +5	% Δ in Abnormal price -5 +5	% Δ in Actual price -10 +10	% Δ in Expected price -10 +10	% Δ in Abnormal price -10 +10
137	2.79%	5.02%	-2.23%	-3.17%	10.03%	-13.20%
139	-5.72%	3.17%	-8.89%	-10.17%	6.34%	-16.51%
140	0.16%	-1.13%	1.29%	1.69%	-2.26%	3.95%
145	8.58%	-1.25%	9.83%	12.81%	-2.50%	15.31%
146	4.08%	6.53%	-2.45%	-4.84%	13.07%	-17.91%
149	-10.96%	-6.20%	-4.76%	-8.14%	-12.41%	4.27%
152	12.85%	9.12%	3.73%	21.01%	18.24%	2.77%
164	4.11%	-3.47%	7.58%	4.54%	-6.94%	11.48%
165	3.26%	0.28%	2.98%	3.55%	0.55%	3.00%
166						
Average	2.13%		0.79%	1.92%		-0.76%
ST DEV	7.10%		5.98%	10.07%		12.14%
P-value	0.39		0.70	0.58		0.86

Appendix Q: T-Test on Market Expectations

% Δ in Actual price - 1 +1		% Δ in Abnormal price -1 +1		% Δ in Actual price - 2 +2		% Δ in Abnormal price -2 +2	
Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
-0.37%	2.45%	-1.37%	1.97%	6.61%	3.46%	4.60%	2.51%
-2.56%	2.63%	-3.19%	2.61%	-4.57%	5.28%	-5.84%	5.24%
-1.63%	3.28%	-1.40%	3.78%	-4.08%	0.32%	-3.63%	1.32%
2.99%	2.79%	3.24%	3.55%	4.37%	0.23%	4.87%	1.76%
2.20%	-0.11%	0.89%	-0.57%	-1.19%	-4.41%	-3.80%	-5.33%
-2.21%	1.83%	-0.97%	1.40%	-4.85%	0.90%	-2.37%	0.04%
5.95%	-3.76%	4.13%	-3.34%	2.58%	-4.87%	-1.07%	-4.03%
1.37%	-1.87%	2.06%	-3.09%	4.13%	-2.38%	5.52%	-4.79%
2.08%	-1.75%	2.02%	-1.98%	2.28%	-4.35%	2.17%	-4.81%
-6.40%	5.81%	-5.29%	5.43%	-9.52%	2.64%	-7.30%	1.88%
	0.95%		-1.34%		-0.55%		-5.14%
	-2.71%		-3.82%		-3.12%		-5.35%
	4.57%		4.96%		4.82%		5.60%
	0.50%		0.40%		0.99%		0.80%
	-2.17%		-2.42%		1.70%		1.20%
	0.59%		0.34%		0.35%		-0.16%
	-6.83%		-7.71%		-4.32%		-6.08%
	1.79%		2.85%		-0.11%		2.01%
	0.04%		0.42%		2.59%		3.35%
	-0.17%		-0.24%		0.25%		0.11%
	3.36%		2.91%		1.85%		0.95%
	-7.82%		-9.52%		-6.16%		-2.76%
	-16.22%		-13.40%		-25.64%		-19.99%
T-TEST	0.643044	0.586928		0.669595		0.71353624	

% Δ in Actual price -5 +5		% Δ in Abnormal price -5 +5		% Δ in Actual price - 10 +10		% Δ in Abnormal price - 10 +10	
Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
2.79%	-9.72%	-2.23%	-12.11%	-3.17%	4.36%	-13.20%	-0.41%
-5.72%	10.97%	-8.89%	10.86%	-10.17%	5.20%	-16.51%	4.98%
0.16%	-4.34%	1.29%	-1.83%	1.69%	1.39%	3.95%	6.41%
8.58%	-5.45%	9.83%	-1.63%	12.81%	-4.21%	15.31%	3.42%
4.08%	-6.71%	-2.45%	-9.02%	-4.84%	-1.87%	-17.91%	-6.03%
-10.96%	1.12%	-4.76%	-1.02%	-8.14%	1.65%	4.27%	-2.64%
12.85%	-7.80%	3.73%	-5.69%	21.01%	-15.79%	2.77%	-11.58%
4.11%	-2.45%	7.58%	-8.48%	4.54%	6.66%	11.48%	-5.40%
3.26%	1.55%	2.98%	0.40%	3.55%	6.06%	3.00%	3.76%
-12.88%	10.31%	-7.32%	8.40%	-22.02%	2.37%	-10.90%	-1.44%
	-6.28%		-17.75%		-15.48%		-38.43%
	6.54%		0.98%		-7.90%		-19.03%
	12.36%		14.30%		13.79%		17.67%
	-2.17%		-2.65%		3.14%		2.17%
	-1.61%		-2.86%		2.81%		0.31%
	-0.73%		-1.99%		6.71%		4.18%
	-1.90%		-6.29%		-0.68%		-9.47%
	-8.10%		-2.80%		-10.17%		0.42%
	1.98%		3.87%		5.59%		9.37%
	2.15%		1.79%		3.14%		2.42%
	-0.78%		-3.03%		-3.37%		-7.86%
	-5.29%		3.22%		-21.15%		-4.13%
	-23.57%		-9.45%		-1.33%		26.92%
T-TEST	0.450467	0.466889		0.93416		0.877754	

Appendix R: List of Abbreviations

BBC	British Broadcasting Corporation
Bn	Billion
BPD	Barrel of Oil per Day
EIA	Energy Information and Administration
EMH	Efficient Market Hypothesis
FT	Financial Times
OPEC	Organisation of Petroleum Exporting Countries
ST DEV	Standard Deviation
UAE	United Arab Emirate
UK	United Kingdom
U.S	United States of America
USD	United States Dollar
WTI	West Texas Intermediate