The Impact of Oil Price on Stock Markets: Evidence from Developed Markets

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ABSTRACT

This thesis empirically investigates the impact of oil price on the stock markets of UK, Canada, USA, and France in the term of real stock returns. In order to do this study some other factors like industrial production and real interest rate are added to the study. Data used in this study is based on monthly time series from1990:01 to 2012:12. Different approach like unit root test and Co-integration Analysis and Level Coefficients and Error Correction Model Estimation were implied to the study. The first aim of the study was to understand the behavior of oil producing and oil consuming countries. According to the test the response of Canada as oil producer to the increase of oil price was positive and the impact was shown in the first month. The rest countries which were oil consumer respond to this change negatively.

Key Words: Oil price, Stock market, Error Correction Model Estimation.

ÖZ

Bu ampirik çalışma petrol fiyatlarının, İngiltere, Kanada, ABD ve Fransa sermaye piyasaları üzerindeki etkilerini reel hisse getirisi üzerinden incelemiştir. Bu çalışmanın yapılabilmesi için endüstriyel üretim ve reel faiz oranı gibi faktörler de çalışmaya dahil edilmiştir. Çalışmada kullanılan veri aylık zaman serisi şeklinde olup 1990:01 ve 2012:12 periyodunu kapsamaktadır. Birim kök testi, Eşbütünleşme analizi, Seviye Katsayıları ve Hata Düzeltme Modeli gibi farklı yaklaşımlar çalışmaya uygulanmıştır. Bu çalışmanın asıl amacı petrol üretici ve tüketici ülkelerin davranışlarını anlayabilmektir. Yapılan testlere göre bir petrol üreticisi olarak Kanada'nın petrol fiyatı artışlarına vermiş olduğu tepki pozitif olup etkinin ilk ayda gözlemlendiğidir. Diğer petrol tüketici ülkelerin ise bu değişime eksi yönde tepki gösterdiğidir.

Anahtar Kelimeler: Petrol fiyatı, borsa, Hata Düzeltme Modeli Tahmini

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller test
ECT	Error Correction Term
PP	Phillips-Perron test
SIC	Schwartz Information Criterion
VECM	Vector Error Correction Model
ECM	Error Correction Model
LnSI	Real Stock Price Index
LnOP	Oil Price
LnIR	Real Interest Rate
LnIP	Real Industrial Production
SI	Stock Index
OP	Oil Price
IND	Industrial Production
IR	Interest Rate
AIC	Akaike Information Criteria

Chapter 1

INTRODUCTION

1.1 Introduction

One of the most important raw materials of the industrialized nations is crude oil.It generates heat, drives machinery, vehicles and airplanes. Almost all chemical products, such as plastics, detergents, paints, and even medicines can be produced by the components of crude oil. It is obvious that crude oil has a great impact on the world economy. According to the recent studies which were conducted in the literature, the impact of oil price on the economy is the most important concern of economists nowadays. The relationship between oil prices and stock markets is another interest to economists. Previous studies do not differentiate oil-exporting countries from oil-importing countries when they investigated the effects of oil price volatilities on the stock market returns.

Volatility in oil prices has a considerable effect on stock prices and profits in developing economies (Basher and Sadorsky, 2006). Moreover, according to the argument of Park and Ratti (2008), if sudden and extreme oil price changes are able to affect the real economy due to the consumer and firm behavior, then these results will affect the world stock market. For these reasons, oil price changes should be carefully examined.

During the last thirty years, oil prices has been fluctuating sharply. Obviously, we can observe the 76% increase in oil prices between March 2007 and July 2008 in contrast to the 48% decrease in prices between July and October in 2008. As a result, it is important to observe how oil prices affect the macro-economic variables. In developing countries, it has been proven that oil prices play a key role in economic activities as stated by Arouri (2009) and Fouguau (2009).

Hamilton (1983) declared that crude oil volatility had a major role in the recession in the U.S. after the world war II. The sharp increase in crude oil prices between 1973 and 1974, the crash of the stock market in 1987, the invasion of Kuwait by Iraq towards the end of 1992, the currency disaster in East Asia in 1997, the terrorist attack in the U.S.A. on September 11th, 2001 and the 2008-2009 world financial crises are only some examples of such changes which has been explained by Aloui and Jammazi (2009).

The reasons that I choose these countries are;

1. The United States is one of the principal countries when it comes to geographical and economical measurements. This country with a huge population spends too much oil to satisfy their people's needs and is considered as the most important oil consumer in the world. Moreover, the country is also famous for being industrious while it has diverse industries to manufacture various products. The United States provides a part of the oil consumption in the country and imports the rest. According to the recent statistics, the daily consumption in United States is 19,150,000 barrels per day approximately.

2. Canada is considered as one the most important oil producers in the world. After discovering oil in this country, there has been many efforts to extract it properly. Majority of Canadian oil resources are located in the province of Alberta. Canada has 4.4 percent of the world's oil production. The country is about to have 179 billion barrels in reserves.

3. The second most important gas producer in the European union is the United Kingdom. U.K. has become an importer of natural gas and crude oil since 2004. The sudden increase in the oil and gas sectors' tax rates caused the sharp decrease in the U.K. oil production.

4. The 12th largest oil consumer and 7th largest net importer of petroleum liquids in 2011 is France. Moreover, the second largest economy in Europe in the field of nominal gross domestic product (GDP) after Germany is France. Because the energy production in this country is limited, France relies on the importing oil and gas to meet their needs in the field of oil and gas production.

1.2 Aim of the Thesis

The focus of this study is to contribute to the literature by investigating oil prices relationship with stock prices and interest rates and industrial productions in the short-run and in the long-run. First, this study identifies major oil producing and consuming countries from a list of the "CIA WORLD FACTBOOK" in 2012. These four countries are selected based on their importance in oil producing and oil consuming and the availability of their data. The two selected major crude oil producing countries are U.S.A. and Canada. They are ranked as 3rd and 6th respectively. France and U.K. are also ranked as 12th and 13th respectively according to their consumptions per day.

1.3 Structure of Study

The present study is structured as follows: In chapter 2 literature review, chapter 3 gives brief information about stock markets of these countries and also gives some information about oil price volatilities. Moreover, data and methodology of econometric analysis is presented in chapter4, theoretical and empirical literatures are explained in chapter 5 and the conclusion and some policy implications are discussed in chapter 6.

Chapter 2

LITERATURE REVIEW

2.1 Stock Return and Oil Price Volatility

Recent trend in the energy sector (crude oil market) has reignited research interest in the oil prices and stock prices long-run relationships. Several studies have been done about this issue such as; Hamilton (1983), Gisser and Goodwin (1986), Hamilton (2000). Researches by Jones and Kaul (1996), Sadorsky (1999), Papapetrou (2001), El Sharif et al (2005), Anoru and Mustafa (2007), and Miller and Ratti (2009) have investigated the effects of oil prices on the stock prices in developed countries. In addition, studies by Maghyereh (2004), Onour (2007), and Narayan and Narayan (2010) explored the relationship between oil prices and stock prices in emerging and developing countries.

Hamilton (1983) provided some evidences of correlation between oil price and economic output, and further he claimed that oil price was blamed for post world war II (1948-1972) recessions in the U.S. economy. According to the author, the oil price change has a negative correlation with the U.S. real GNP growth, which indicated the economic recession. Gisser and Goodwin (1986) provided evidence in support of Hamilton's findings.

Jones and Kaul (1996) studied the response of international stock markets to the changes of oil prices using quarterly data. The study focused on stock returns from the U.S., Canada, U.K. and Japan, utilized simple regression models, and reported that the stock returns for all countries (except the U.K.) were negatively impacted by oil prices. Sadorsky (1999) used monthly data to probe the relationship between oil prices and stock returns for the U.S. from January 1947 to April 1996. The author applied variance decomposition. The findings suggested that oil prices and stock returns have a negative relationship in the short-term, meaning higher oil prices lead to lower stock returns. He also provided some evidences that oil price changes have asymmetric effects on the economy.

Papapetrou (2001) used vector error correction modeling to study the effect of oil prices on stock returns for Greece applying daily data and the variance decomposition. The study showed a negative oil prices effect on stock returns that extended over four months. Also, he found that changes in oil price affect the real economic activities and employments. Maghyereh (2004) studied the dynamic linkage between oil prices and stock returns in 22 emerging economies using the unrestricted Vector Autoregressive (VAR) with daily data. The research investigated the effectiveness of innovations transmission from the oil market to emerging equity markets, utilizing forecast error variance decomposition and impulse response analysis. He said that, a plot of each emerging equity market responses to a shock in the oil price. He also suggested a gradual transmission with the equity market reacting to the shock two days after. While the speed of adjustment slowly declined to zero on the fourth day in 16 countries, the response continued to the seventh day in Argentina, Brazil, China, Czech Republic, Egypt, and Greece. The impulse response demonstrated gradual diffusion of innovations from the oil market into the emerging equity markets. Furthermore, the author postulated the slow adjustment to imply the presence of inefficiency in the emerging equity markets transmission of innovations from the oil market. The variance decomposition revealed very weak evidence of co-integration between oil price shocks and stock market returns. In addition, the author stated that the oil market is an ineffective influence on the equity market because the sizes of responses are very small.

Anoruo and Mustafa (2007) analyzed a relationship between oil and stock returns for the US using daily data. The result indicated a long-run relationship between oil and stock returns in the US. The estimated Vector-error-correction Model (VECM) showed evidence of causality from the stock market returns to the oil market and not vice versa. Gounder and Bartleet (2007) studied the impact of oil price on the New Zealand's economic growth over the period 1989-2006. The New Zealand's economy is sensitive to the world oil price fluctuation base on Gounder and Bartleet (2007). They showed that there is a negative relationship between the oil price volatility and economic growth.

Park and Ratti (2009) had an investigation about finding linkage between oil price shock and stock returns. They analyzed U.S. and 13 European countries over 1986-2005. They realized that oil price has a significant impact on real stock return. Also, they showed that Norway as an oil exporter had a positive response to real stock return because of volatility in oil price. Jbir and Zouari-Ghorbel (2009) applied (VRA) model to find out the relationship between oil prices and macroeconomic factors of Tunisia in 1993 to 2007. In the study, they found out that oil price shock did not have a direct impact on the economy.

Narayan and Narayan (2010) measured the relationship between oil prices and Vietnam’s stock prices with daily series from 2000 to 2008. Applying the Johansen test, results showed evidence of oil prices, stock prices, and exchange rates for Vietnam sharing a long-run relationship. Moreover, the study showed both oil prices and exchange rates have a positive and statistically significant impact on Vietnam's stock prices in the long-run but not in the short-run.

Ono (2011) by applying the (VAR) model in 2011 found out the relationship between oil prices and real stock returns for Brazil, China, India, and Russia. The real stock return respond positively for all of them and it was significant for Brazil. Hamilton (2011) said that after the post war the world had economic recessions. Berk and Aydogan (2012) showed the effect of oil price on Turkey stock market. They applied (VAR) model for analyzing the effect of Brent crude oil prices on the Istanbul stock exchange between 1990 to 2011.

Lee and Chiou (2011) used the regime-switching model to find out asymmetric effect of oil prices on stock returns. They demonstrated that unforeseen asymmetric change in price would lead to the negative effect on S&P 500 return. On the other hand, the same result did not hold in a regime of lower oil price variations. As a result, they said that a proper diversified portfolio with proper considering the volatility of oil price will lead to the better oil price risk strategies.

Chapter 3

STOCK MARKETS REVIEW AND OIL PRICE VOLATILITY

3.1 New York Stock Exchange

New York Stock Exchange with U.S. $14.085 trillion in 2012 is one of the most important stock exchanges in the world. The stock exchange is located in New York and has U.S. $153 billion daily trading. In 2007, NYSE merged with Euronext and they have been operating with each other until today. The NYSE composite index is the most important index which covers all of the listed common stocks on NYSE. For this study, the S&P 500 index has been chosen. This index is included stock prices of 500 famous companies in NYSE and is controlled by Standard & Poor's.

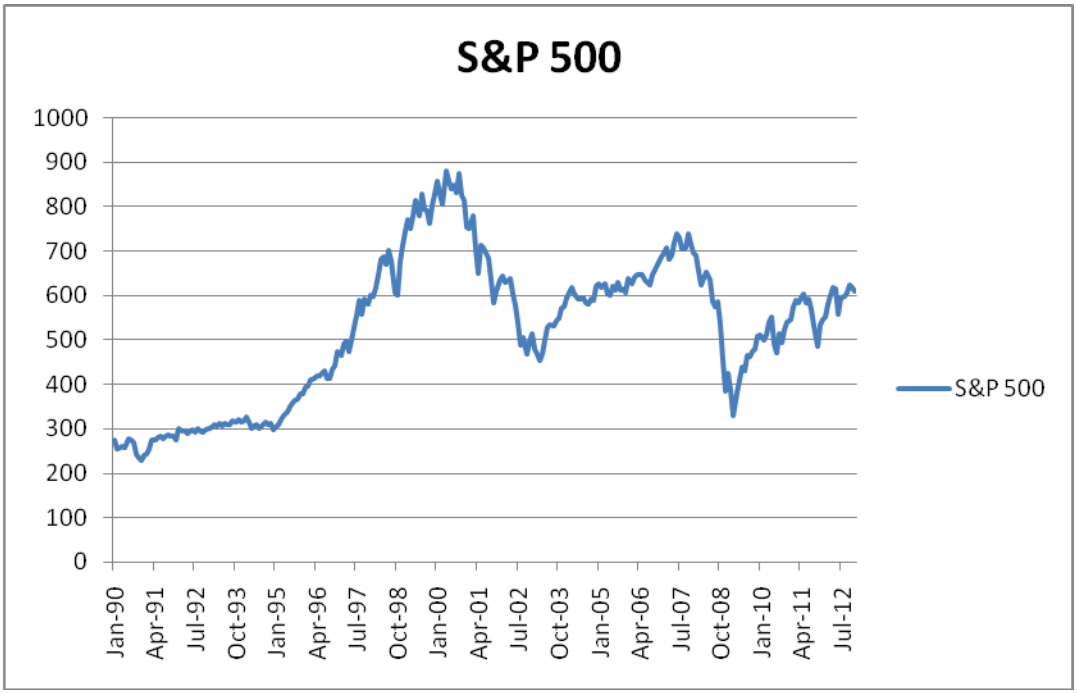

Figure1. S&P 500 Index 1990-2012

3.2 Toronto Stock Exchange

The crucial stock exchange in Canada is Toronto Stock Exchange (TSX). This stock exchange is controlled by TMX group. TMX includes many oil and gas companies which can be used easily to find out the effects of oil price volatilities on the stock markets of these companies. Therefore, we choose the main index S&P/TSX of this stock market for our analysis.

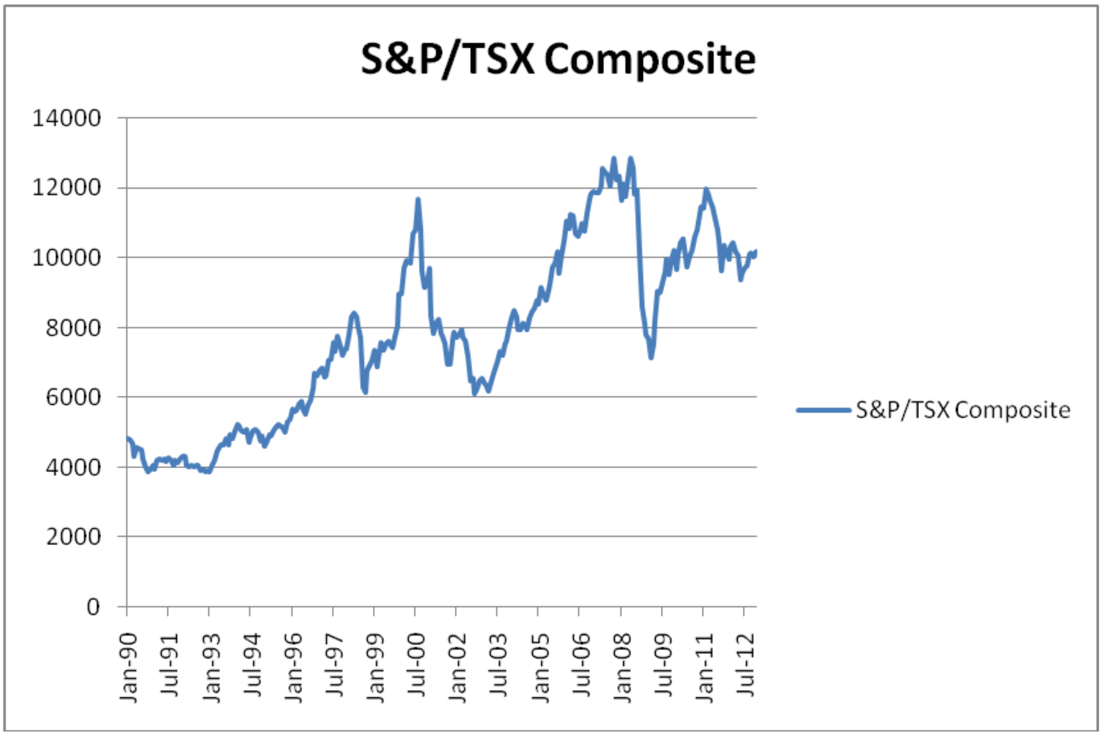

Figure 2. S&P/TSX Index 1990-2012

3.3 Paris Stock Exchange

The Bourse de Paris constitutes of Amsterdam, Brussels and Paris stock exchange which are combined in September 2000. The second important and largest stock exchange in Europe is Euronext stock exchange. The major index of Euronext Paris is "CAC 40" that includes 40 famous companies in France which most of them is governed by foreigners.

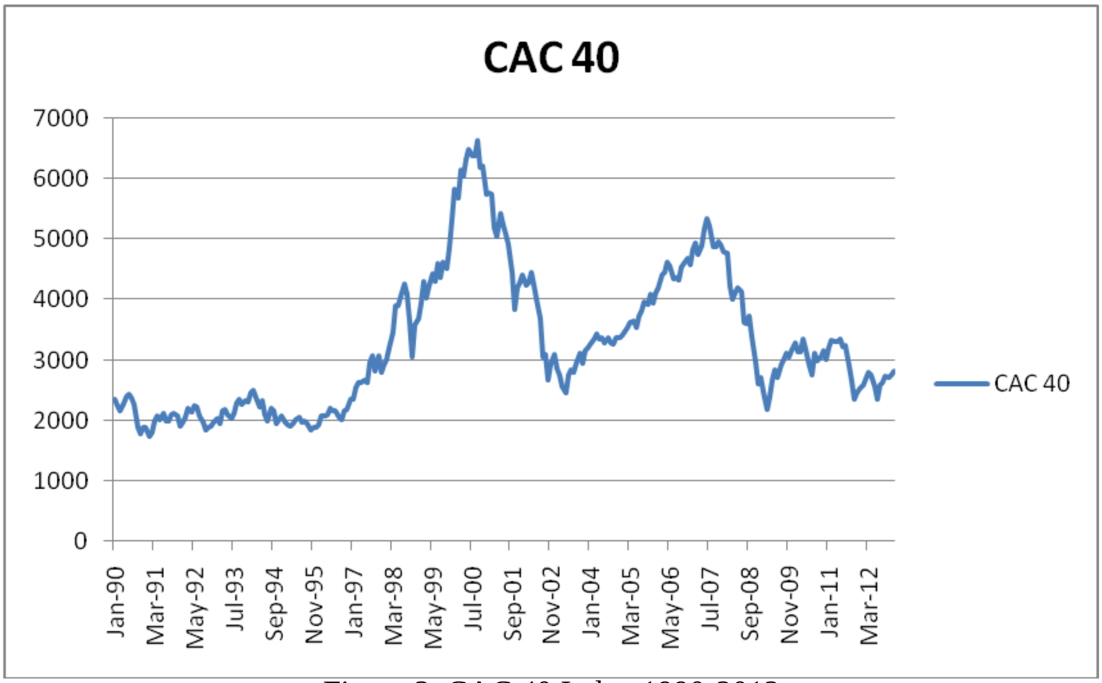

Figure 3. CAC 40 Index 1990-2012

3.4 London Stock Exchange

London stock exchange is the third major and largest stock exchange in the world which was established in 1801 and owned US$3.2 trillion by the end of 2012. LSE constitutes the major companies around the world, and the main index of this market is FTSE 100 or informally, "footsie" which constitutes of index of 100 companies that are listed in LSE. FTSE seems to be an indicator of business prosperity and is the most widely used stock index.

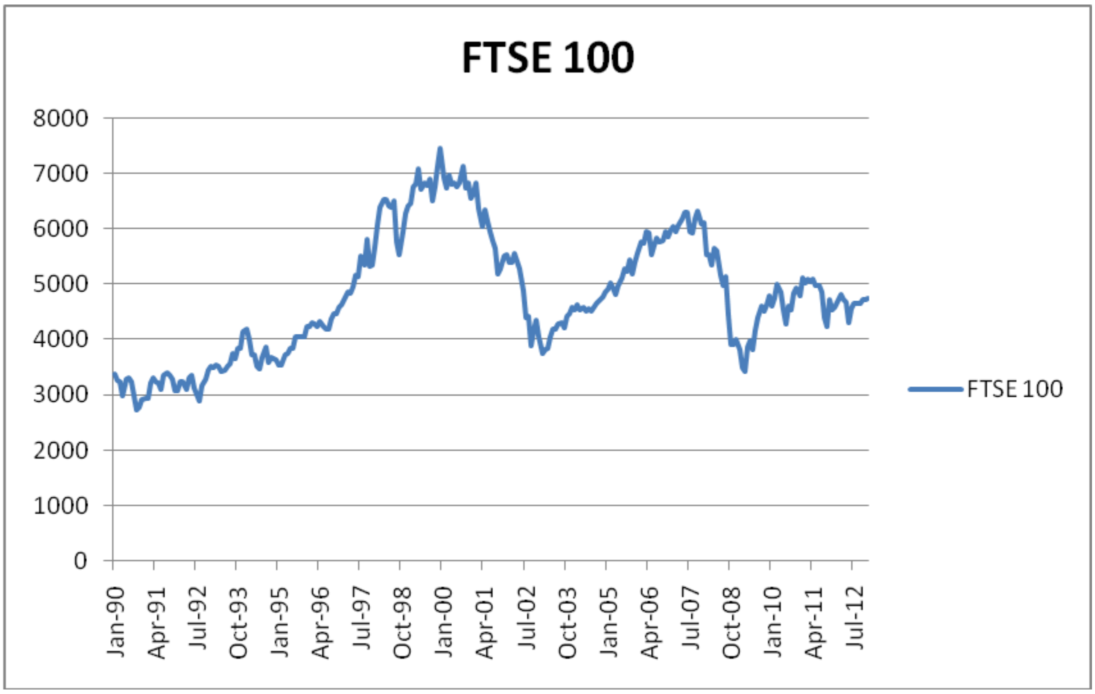

Figure 4. FTSE 100 Index 1990-2012

3.5 Oil Price Volatility

The oil price volatilities may influence the economy in different ways and various channels. Because of the importance of the oil price volatility, economists have done some researches in the field of oil price volatility and financial markets. For example, Jones and Kaul (1996) have done a research about the impact of oil price on the several stock markets such as Canada, U.S, Japan, and U.K. They found various results for these countries. They observed that the effect of oil price on the U.S. and Canada real cash flow is significant while for U.K and Japan is not significant. Moreover, Sadorsky (1999) conducted a study about the effect of oil price in the U.S.A. stock market which suggested that oil price has the significant effect on the stock market. Faff, Brailsford (1999) have reached the same result as Sadorsky (1999) for Australia. Papapetrou (2001) also has found the same conclusion for

Greek. Park and Rotti (2008) declared that oil price volatility has negative effect on oil importer and positive effect on oil exporter countries.

If the demand and supply of oil changes during a period then, there will be oil price volatilities. These changes in the price of oil will be negative or positive, but in many cases it is negative. For example if the demand for oil increases the price of oil will increase too, and if the demand for oil decreases then the price of oil will decrease. There are many factors that may cause oil price to get fluctuated as Hamilton (2011) and Cavallo and Wu (2006) declared. These factors and events are: Post-war II reconstruction (1946), nationalization of Iran oil industry (1951), breaking the supply by Korean war (1952), crisis of Suez (1956), Yum Kippure war (1973), OPEC oil prohibition (1973), solstice of Iran (1978), Iran and Iraq war (1980), Persian Gulf war (1990), financial crisis in Asia (1997), the September 11 attacks (2001), Venezuela strike and chaos (2002), Persian Gulf second war (2003), spike of oil price (2007), global financial crisis (2008), Japanese tsunami and Arab spring (2011).

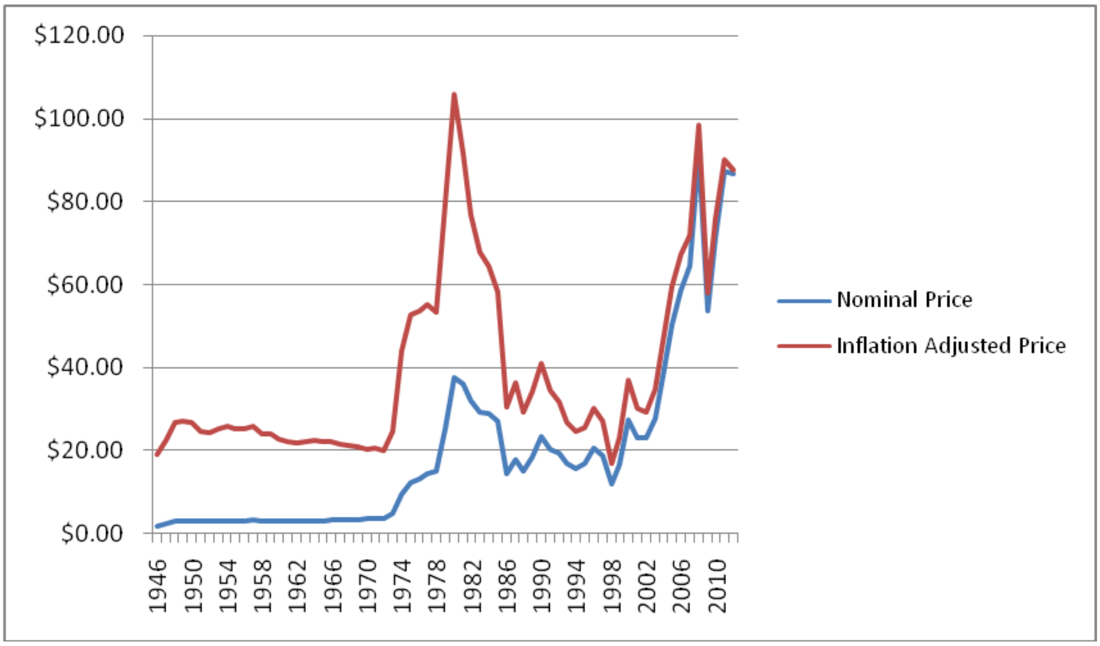

Figure 5. World Events and Crude Oil Prices Since 1946

Chapter 4

DATA AND METHODOLOGY

4.1 Source of Data

Data that is used in this thesis is based on monthly time series of Canada, U.K, U.S. and France over the period of 1990:1-2012:1. The variables are real interest rate, industrial production index, real stock return in stock markets and real oil price (in USD). Data for this thesis is acquired from Thomson Reuters DataStream and OECD database.

The real interest rate has been chosen for this thesis because this factor will explain stock price movements. Industrial production index is an indicator which measures the real output of mining, manufacturing and utilities. Industrial production index has picked out because the total amount of energy consumption in an economy depends on the amount of goods and services that is produced in the country. The real oil price is assumed to be Brent crude oil in this thesis. The reason for choosing this variable is that nearly 60% of total daily crude oil consumption is benchmarked by Brent oil price. Moreover, all types of crude oil price has been perceived to move in the same direction empirically (Chang and Wong, 2003). Park and Ratti (2008) suggest that significant effect of oil price shock can be better captured by Brent. Real stock return is defined as continuously compounded monthly return on stock price index deflated by each country's CPI (Park and Ratti, 2008).

4.2 The APT Model: The Arbitrage Pricing Theory

The Arbitrage Pricing Theory (APT) is an alternative model of asset pricing. “The idea that equilibrium market prices ought to be rational in the sense that prices will move to rule out arbitrage opportunities perhaps the most fundamental concept in capital market theory” (Bodie, et al., 1996).

This theory consists with the analysis of how investors construct efficient portfolios and offers a new approach for explaining the asset prices. It also states that the return on any risky asset is a linear combination of various macroeconomic factors that are not explained by this theory namely. Therefore, unlike the CAPM model, this theory specifies a simple linear relationship between assets, returns and the associated key factors. Roll and Ross (1980) states that “this pricing relationship is the central conclusion of the APT and it will be the corner stone of our empirical testing”. However, the original APT was modified in considering the data collected for my thesis. Therefore, the following model has been estimated which contains stock returns as dependent variable and oil price, interest rate and industrial production as explanatory variables reacts to its equilibrium after a change in independent variables. This can be expressed as below:

$$SI_t = a_t + b_{t1}OP_1 + b_{t2}IP_2 + b_{t3}IR_3 + \varepsilon_t \qquad (1)$$

Where

- a_t is a constant for Stock return
- OP_1 is the Oil price
- IP_2 is the industrial production
- IR_3 is the interest rate
- ε_t is the change in price with mean zero.

4.3 Methodology

In this thesis, three types of analysis have been carried out to estimate the models. First of all, Augmented Dickey-Fuller (ADF) and Philips-Perron (pp) unit root tests were undertaken to check the stationary of selected variables. Second, Johansen (1990) co-integration test was applied to clarify the long-run relationship among variables. The third test is Level Coefficients and Error Correction Model Estimation. Once co-integrating relationship has been confirmed, the next step is to estimate long-term coefficients, short-term coefficients, and error correction term.

4.3.1 Unit Root Tests

Unit root tests were used to examine whether a time-series variable is stationary or not. The most important ones that are used in many tests are Augment Dickey-Fuller(1979) and the Philips-Perron (1988). The following model is used to test for unit root by including constant and trend:

The rejection of the null hypothesis means that series is stationary. If the series is non-stationary at level, then we take the first difference to make it stationary. If the series is stationary at level, then it is said to be integrated of order zero or called I (0); but if it is non-stationary, it is integrated of order one or called I (1). The Philips-Perron (1988) test improved to serial correlation and heteroskedasticity in the errors by altering the Dickey-Fuller tests statistics. This is done by the Newey-West (1987) heteroskedasticity and autocorrelation consistent covariance matrix estimator.

4.3.2 Co-integration Test

When the order of integration for variables is indicated then the co-integration test among the variables should be done. This test will help us to find out the relationship among the variables. The co-integrating vector is obtained where trace statistics is greater than critical values at 0.01 or 0.05 level. Therefore, the null hypothesis of no co-integrating vector can be rejected.

4.3.3 Level Coefficients and Error Correction Model Estimation

In this section, the long-run coefficients of proposed econometric equation will be estimated to find out whether regresses have statistically significant impacts on dependent variables or not in the long-run. The error correction term (ECT) will help us to clarify the speed of discrepancy between short-term and long-term values of dependent variables.

$$\ln SI_t = \beta_0 + \beta_1 \ln OP_t + \beta_2 \ln IP_t + \beta_3 \ln IR_t + \varepsilon_t \qquad (2)$$

$$\Delta \ln SI_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln SI_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln OP_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln IP_{t-j} \qquad (3)$$
$$+ \sum_{i=0}^{n} \beta_4 \Delta \ln IR_{t-j} + \beta_5 \varepsilon_{t-1} + u_t$$

Where

- ε_{t-1} is error correction term.

Chapter 5

EMPIRICAL RESULTS

5.1 Unit Root Tests for Stationary

This section of the study will evaluate the stationary nature of the variables under consideration.

5.1.1 Unit Root Tests for UK

Results of unit root tests with this respect in the case of the UK are presented in Table 1. It is seen that in the case of lnSI variable, the null hypothesis of a unit root cannot be rejected when including trend and intercept, only intercept, and neither trend nor intercept. This result is the same in both ADF and PP tests. However, when lnSI is differenced, we see that the null hypothesis of a unit root can be rejected in all of the model options; this is because both ADF and PP test statistics are statistically significant. Therefore, it is concluded that lnSI in the case of the UK is non-stationary at levels but become stationary at first differences; this suggests that lnSI in the UK is integrated of the first order, I (1).

The second variable in the case of the UK is lnIR where the null hypothesis of a unit root cannot be rejected when including trend and intercept or only intercept in both ADF and PP tests. Although the null hypothesis of a unit root can be rejected when including no trend and no intercept, it is important to note that trend and intercept coefficients in the most general model are statistically significant in the normal distribution (see Enders, 1995). Therefore, we conclude that lnIR in the UK is a non-stationary variable. On the other hand, lnIR is differenced, it is seen that the null hypothesis of a unit root can be rejected all the time; therefore, this suggests that like lnSI, lnIR is also integrated of the first order, I (1).

When lnOP and lnIP are evaluated in the case of the UK, results are the same with the case of lnSI, which means that the null hypothesis of a unit root cannot be rejected at levels but can be rejected at first differences of lnOP and lnIP; therefore, we conclude that they are also integrated of the first order, I (1).

Table 1. ADF and PP Tests for Unit Root for UK

Statistics (Level)	ln SI	Lag	ln IR	lag	lnOP	Lag	ln IP	Lag
τ_T (ADF)	-1.67	(0)	-2.39	(3)	-2.91	(0)	-1.45	(3)
τ_μ (ADF)	1.82	(0)	-0.99	(3)	-1.08	(0)	-1.56	(3)
τ (ADF)	0.41	(0)	-1.62***	(3)	0.43	(0)	-0.20	(1)
τ_T (PP)	-1.70	(6)	-1.63	(10)	-3.05	(6)	-1.74	(8)
τ_μ (PP)	-1.84	(6)	-0.45	(10)	-1.02	(8)	-1.85	(8)
τ (PP)	0.41	(5)	-1.69***	(11)	0.53	(10)	-0.17	(7)
Statistics (First Difference)	Δln SI	Lag	Δln IR	lag	Δln OP	Lag	Δln IP	Lag
τ_T (ADF)	-7.56*	(3)	-5.20*	(2)	-9.024*	(3)	-21.30*	(0)
τ_μ (ADF)	-7.52*	(3)	-5.19*	(2)	-9.022*	(3)	-21.28*	(0)
τ (ADF)	-7.52*	(3)	-5.03*	(2)	-8.99*	(3)	-21.32*	(0)
τ_T (PP)	-15.93*	(4)	-8.72*	(5)	-15.66*	(11)	-20.65*	(8)
τ_μ (PP)	-15.92*	(5)	-8.72*	(5)	-15.65*	(11)	-20.64*	(8)
τ (PP)	-15.93*	(5)	-8.48*	(5)	-15.64*	(10)	-20.67*	(8)

Note:
SI represents real stock index; IR is the real interest rate; OP is the real oil price; and IP is industrial production. All of the series are at their natural logarithms. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in ADF test (as determined by AIC set to maximum 3) to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models (See Enders, 1995: 254-255). *, ** and *** denote rejection of the null hypothesis at the 1 percent, 5 percent and 10 percent levels respectively. Tests for unit roots have been carried out in E-VIEWS 7.0.

Both ADF and PP unit root tests in this thesis have proved that lnSI, lnIR, lnOP, and lnIP are all integrated of the first order, which means that they become stationary only when they are difference and that they are I (1). In the next step, unit root tests for the same variables will be considered in the case of Canada.

5.1.2 Unit Root Tests for Canada

Results of unit root tests with this respect in the case of the Canada are presented in Table 2. It is seen that in the case of lnSI variable, the null hypothesis of a unit root cannot be rejected when including trend and intercept, only intercept, and neither trend nor intercept. This result is the same in both ADF and PP tests. However, when lnSI is differenced, we see that the null hypothesis of a unit root can be rejected in all of the model options; this is because both ADF and PP test statistics are statistically significant. Therefore, it is concluded that lnSI in the case of the Canada is non-stationary at levels but become stationary at first differences; this suggests that lnSI in Canada is integrated of the first order, I (1).

The second variable in the case of Canada is lnIR where the null hypothesis of a unit root cannot be rejected when including trend and intercept or only intercept in both ADF and PP tests. Although the null hypothesis of a unit root can be rejected when including no trend and no intercept, it is important to note that trend and intercept coefficients in the most general model are statistically significant in the normal distribution (see Enders, 1995). Therefore, we conclude that lnIR in the Canada is a non-stationary variable. When, on the other hand, lnIR is differenced, it is seen that the null hypothesis of a unit root can be rejected all the time, therefore, this suggests that like lnSI, lnIR is also integrated of the first order, I (1).

When lnOP and lnIP are evaluated in the case of Canada, results are the same with the case of lnSI, which means that the null hypothesis of a unit root cannot be rejected at levels but can be rejected at first differences of lnOP and lnIP; therefore, we conclude that they are also integrated of the first order, I (1).

Table 2. ADF and PP Tests for Unit Root for Canada

Statistics (Level)	ln SI	Lag	ln IR	Lag	ln OP	Lag	ln IP	Lag
τT (ADF)	-2.49	(1)	-2.88	(3)	-2.94	(0)	-2.87	(0)
τμ (ADF)	-1.34	(1)	-1.58	(2)	-1.04	(0)	-0.76	(0)
τ (ADF)	0.85	(1)	-1.87***	(2)	0.51	(0)	0.78	(0)
τT (PP)	-2.53	(4)	-2.72	(9)	-3.07**	(6)	-3.02	(6)
τμ (PP)	-1.27	(2)	-1.56	(9)	-0.91	(9)	-0.64	(9)
τ (PP)	0.87	(2)	-1.81***	(9)	0.65	(10)	0.95	(11)
Statistics (First Difference)	Δln SI	Lag	Δln IR	Lag	Δln OP	Lag	Δln IP	Lag
τT (ADF)	-14.25*	(0)	-8.94*	(1)	-9.066*	(3)	-9.048*	(3)
τμ (ADF)	-14.28*	(0)	-8.95*	(1)	-9.063*	(3)	-9.047*	(3)
τ (ADF)	-14.25*	(0)	-8.88*	(1)	-9.026*	(3)	-8.97*	(3)
τT (PP)	-14.27*	(2)	-14.45*	(8)	-15.76*	(11)	-15.59*	(12)
τμ (PP)	-14.29 *	(2)	-14.47*	(8)	-15.74*	(11)	-15.57*	(11)
τ (PP)	-14.25 *	(1)	-14.44*	(8)	-15.72*	(11)	-15.51*	(10)

5.1.3 Unit Root Tests for U.S.A

When lnSI, lnOP and lnIR are evaluated in the case of the USA as you can see in the Table 3, The null hypothesis of a unit root cannot be rejected when including trend and intercept, only intercept, and neither trend nor intercept. This means that the null hypothesis of a unit root cannot be rejected at levels but can be rejected at first differences for lnSI, lnOP and lnIR; therefore, we conclude that they are also integrated of the first order, I (1). Also, in the case of lnIP we find out that the null hypothesis of a unit root can be rejected when including no trend and no intercept, it is important to note that trend and intercept coefficients in the most general model are statistically significant in the normal distribution (see Enders, 1995). Therefore, we conclude that lnIP in the USA is a non-stationary variable. When, on the other hand, lnIP is differenced, it is seen that the null hypothesis of a unit root can be rejected all the time, therefore, this suggests that like other variables it is also integrated of the first order, I(1).

Table 3. ADF and PP Tests for Unit Root for USA

Statistics (Level)	ln SI	Lag	ln IR	lag	ln OP	lag	ln IP	Lag
τ_T (ADF)	-1.40	(0)	-1.96	(3)	-2.89	(0)	-1.51	(3)
τ_μ (ADF)	-1.64	(0)	-0.68	(2)	-1.14	(0)	-1.42	(3)
τ (ADF)	0.95	(0)	-0.97	(2)	0.39	(0)	1.72***	(3)
τ_T (PP)	-1.51	(6)	-1.66	(9)	-3.01	(6)	-1.28	(12)
τ_μ (PP)	-1.68	(6)	-0.53	(9)	-1.00	(9)	-1.58	(12)
τ (PP)	0.88	(6)	-0.88	(9)	0.53	(11)	2.14**	(12)

Statistics (First Difference)	Δln SI	Lag	Δln IR	lag	Δln OP	lag	Δln IP	Lag
τ_T (ADF)	-15.76*	(0)	-6.63*	(3)	-9.089*	(3)	-4.36*	(3)
τ_μ (ADF)	-15.73*	(0)	-6.62*	(3)	-9.084*	(3)	-4.31*	(3)
τ (ADF)	-15.68*	(0)	-6.45*	(3)	-9.057*	(3)	-4.03*	(3)
τ_T (PP)	-15.78*	(6)	-16.38*	(8)	-15.855*	(12)	-15.24*	(11)
τ_μ (PP)	-15.75*	(6)	-16.39*	(8)	-15.817*	(11)	-15.20*	(11)
τ (PP)	-15.72*	(5)	-16.50*	(9)	-15.805*	(11)	-15.04*	(12)

5.1.4 Unit Root Tests for France

When lnSI, lnIR, lnOP and lnIP are evaluated in the case of the France as it is shown in Table 4, we will see that the null hypothesis of a unit root cannot be rejected when including trend and intercept, only intercept, and neither trend nor intercept. Which means that the null hypothesis of a unit root cannot be rejected at levels but can be rejected at first differences of lnSI, lnIR, lnOP and lnIP; therefore, we conclude that they are also integrated of the first order, I (1).

Table 4. ADF and PP Tests for Unit Root for France

Statistics (Level)	ln SI	Lag	ln IR	Lag	ln OP	lag	ln IP	Lag
τ_T (ADF)	-1.55	(1)	-0.65	(3)	-2.90	(0)	-1.33	(3)
τ_μ (ADF)	-1.69	(1)	1.11	(3)	-1.00	(0)	-1.47	(3)
τ (ADF)	0.15	(1)	-0.58	(3)	0.54	(0)	-0.29	(3)
τ_T (PP)	-1.55	(5)	-0.95	(11)	-3.03	(6)	-1.41	(7)
τ_μ (PP)	-1.64	(5)	0.72	(11)	-0.87	(9)	-1.54	(7)
τ (PP)	0.10	(4)	-1.05	(12)	0.68	(10)	-0.28	(7)
Statistics (First Difference)	Δln SI	Lag	Δln IR	Lag	Δln OP	lag	Δln IP	Lag
τ_T (ADF)	-15.147*	(0)	-3.17^{***}	(3)	-9.046^{*}	(3)	-6.37^{*}	(3)
τ_μ (ADF)	-15.148*	(0)	-2.96^{**}	(3)	-9.044*	(3)	-6.33^{*}	(3)
τ (ADF)	-15.173^{*}	(0)	-2.72^{*}	(3)	-9.004^{*}	(3)	-6.34^{*}	(3)
τ_T (PP)	-15.135*	(3)	-13.15^{*}	(11)	-15.729^{*}	(12)	-20.86^{*}	(9)
τ_μ (PP)	-15.138^{*}	(3)	-13.02^{*}	(11)	-15.698^{*}	(11)	-20.84^{*}	(9)
τ (PP)	-15.163^{*}	(3)	-12.83^{*}	(11)	-15.674^{*}	(11)	-20.87^{*}	(9)

5.2 Co-integration Analysis

Unit root tests of this study have revealed that all the series of countries under consideration are non-stationary but integrated of the same order, I (1); therefore, further detection for the long term economic relationship among the variables is needed. It is important to note that we meet conditions to continue with co-integration tests using the Johansen methodology (See Enders, 1995).

5.2.1 Co-integration Analysis for UK

Results of the Johansen co-integration tests in the case of the UK are presented in Table 5. The dependent variable is lnSI where lnIR, lnOP and lnIP are regressors. Using monthly data, it is seen that co-integrating vector is obtained at that lag structure of 23 where trace statistics is greater than critical values at not 0.01 levels but at 0.05. Therefore, the null hypothesis of no co-integrating vector in this table can be rejected at the 95 percent confidence interval. It is, therefore, concluded that lnSI in the UK is in the long term economic relationship with lnIR, lnOP, and lnIP during the selected sample period.

Table 5. Co-integration Analysis for UK

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.106992	53.33868	47.21	54.46
At most 1	0.072446	24.93564	29.68	35.65
At most 2	0.022687	6.059313	15.41	20.04
At most 3	0.001192	0.299395	3.76	6.65

5.2.2 Co-integration Analysis for Canada

Results of the Johansen co-integration tests in the case of the Canada are presented in Table 6. It is seen that co-integrating vector is obtained at first lag where trace statistics is greater than critical values at 0.05 levels. Therefore, the null hypothesis of no co-integrating vector in this table can be rejected at the 95 percent confidence interval. It is, therefore, concluded that lnSI in Canada is in the long term economic relationship with lnIR, lnOP and lnIP during the selected sample period.

Table 6. Co-integration Analysis for Canada

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.095435	53.90500	47.21	54.46
At most 1	0.069101	27.32528	29.68	35.65
At most 2	0.027592	8.350205	15.41	20.04
At most 3	0.003525	0.935671	3.76	6.65

5.2.3 Co-integration Analysis for U.S.A

Results of the Johansen co-integration tests in the case of the USA are presented in Table 7. It is seen that co-integrating vector is obtained at lag 22 where trace statistics is greater than critical values at 0.05 levels. Therefore, the null hypothesis of no co-integrating vector in this table can be rejected at the 95 percent confidence interval. It is, therefore, concluded that lnSI in USA is in the long term economic relationship with lnIR, lnOP and lnIP during the selected sample period.

Table 7. Co-integration Analysis for USA

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.104502	53.29407	47.21	54.46
At most 1	0.069836	25.36904	29.68	35.65
At most 2	0.027468	7.053132	15.41	20.04
At most 3	2.59E-05	0.006549	3.76	6.65

5.2.4 Co-integration Analysis for France

Results of the Johansen co-integration tests in the case of the France are presented in Table 8. It is seen that co-integrating vector is obtained at first lag where trace statistics is greater than critical values at 0.05 level. Therefore, the null hypothesis of no co-integrating vector in this table can be rejected at the 95 percent confidence interval. It is, therefore, concluded that lnSI in France is in the long term economic relationship with lnIR, lnOP and lnIP during the selected sample period.

Table 8. Co-integration Analysis for France

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.110822	50.80451	47.21	54.46
At most 1	0.037659	18.62110	29.68	35.65
At most 2	0.027243	8.103321	15.41	20.04
At most 3	0.001952	0.535308	3.76	6.65

5.3 Level Coefficients and Error Correction Model Estimation

Once co-integrating relationship has been confirmed for the countries, the next step is to estimate long term coefficients of SI = f (OP, IP, IR), short term coefficients, and error correction term in the cases of UK, Canada, USA, and France. Firstly, the case of the UK will be evaluated:

5.3.1 Error Correction Model Estimation for UK

Table 10 provided results of long term and error correction models in the case of the UK at lag 12. Table 10 shows that the long term coefficients of lnOP and lnIR are not statistically significant; but the long term coefficient of lnIP is statistically significant at the 0.01 level but is negative ($b = -7.262$, $p < 0.01$). This reveals that when industrial production changes by one percent, stock prices in the UK will change by 7.262 percent in the reverse direction. It is interesting to see that movements in the industrial sector and stock markets in the UK are in reverse directions.

When the short term coefficients are considered, it is seen that the coefficient of lnOP is statistically significant at the 0.05 level but is negative at lag 1 ($b = -0.065$, $p < 0.05$); this suggests that oil prices in the UK exerts negative effects on stock markets in the shorter periods. It is seen from Table 9 that the other short term coefficients of the other variables are not statistically significant which denotes that short term movements in lnIR and lnIP do not exert statistically significant effects on lnSI.

The error correction term of the model, SI = f (OP, IND, IR), in the case of the UK is -0.0389, which is negative and statistically significant ($p < 0.10$) as expected (Gujarati, 2003). This reveals that the stock market in the UK reacts to its long term equilibrium path by 3.89 percent speed of adjustment every month through the channels of oil prices, industrial production, and interest rates. When thinking that dataset in this study covers monthly figures, this ratio is not so low. This results show that the regressors of lnOP, lnIR, and lnIP contribute to lnSI to move to its long term equilibrium level.

If results are summarized for the case of the UK, the model of SI = f (OP, IND , IR) is a long run model for the case of the UK and we can say that oil prices, interest rates, and industrial production in the UK are long term contributors of the stock market movements. Although long term coefficient of oil price is not statistically significant its short term coefficient is statistically significant for stock market movements.

Table 9. Error Correction Model for UK

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1}$	-0.038979	-1.72767	0.0225
$lnSI_{t-1}$	0.103476	1.49799	0.06908
$lnSI_{t-2}$	-0.023384	-0.33045	0.07077
$lnSI_{t-3}$	0.016712	0.23368	0.07152
$lnSI_{t-4}$	0.105110	1.46250	0.07187
$lnSI_{t-5}$	-0.017686	-0.24574	0.07197
$lnSI_{t-6}$	-0.016334	-0.22509	0.07257
$lnSI_{t-7}$	0.039835	0.55236	0.07212
$lnSI_{t-8}$	0.060700	0.83751	0.07248
$lnSI_{t-9}$	0.099912	1.40875	0.07092
$lnSI_{t-10}$	0.062443	0.89447	0.06981
$lnSI_{t-11}$	-0.102692	-1.48476	0.06916
$lnSI_{t-12}$	0.034646	0.51094	0.06781
$lnOP_{t-1}$	-0.065302	-2.26220	0.02887
$lnOP_{t-2}$	-0.001968	-0.06710	0.02933
$lnOP_{t-3}$	0.004437	0.15091	0.02940
$lnOP_{t-4}$	-0.041306	-1.37848	0.02996
$lnOP_{t-5}$	-0.017548	-0.60178	0.02916
$lnOP_{t-6}$	-0.016132	-0.55631	0.02900
$lnOP_{t-7}$	-0.016568	-0.57653	0.02874
$lnOP_{t-8}$	0.002762	0.09511	0.02904
$lnOP_{t-9}$	-0.010276	-0.35321	0.02909
$lnOP_{t-10}$	-0.002470	-0.08592	0.02875
$lnOP_{t-11}$	0.009600	0.33656	0.02852
$lnOP_{t-12}$	-0.047457	-1.64619	0.02883
$lnIR_{t-1}$	-0.022506	-0.37738	0.05964
$lnIR_{t-2}$	0.003191	0.05188	0.06150
$lnIR_{t-3}$	0.071339	1.14162	0.06249
$lnIR_{t-4}$	-0.065735	-1.03232	0.06368
$lnIR_{t-5}$	-0.080254	-1.26541	0.06342
$lnIR_{t-6}$	-0.054020	-0.84630	0.06383
$lnIR_{t-7}$	-0.001968	-0.03081	0.06385
$lnIR_{t-8}$	-0.017374	-0.27609	0.06293
$lnIR_{t-9}$	-0.010603	-0.16944	0.06258
$lnIR_{t-10}$	0.065888	1.09834	0.05999
$lnIR_{t-11}$	-0.016508	-0.28366	0.05820
$lnIR_{t-12}$	-0.114482	-2.16257	0.05294
$lnIP_{t-1}$	0.308802	0.91973	0.33575
$lnIP_{t-2}$	-0.038555	-0.10775	0.35783
$lnIP_{t-3}$	0.764826	2.14946	0.35582
$lnIP_{t-4}$	-0.327445	-0.91615	0.35741
$lnIP_{t-5}$	-0.296655	-0.84841	0.34966
$lnIP_{t-6}$	-0.259156	-0.73874	0.35081
$lnIP_{t-7}$	0.440837	1.23207	0.35780
$lnIP_{t-8}$	0.238630	0.65564	0.36396
$lnIP_{t-9}$	0.168306	0.36750	0.36750
$lnIP_{t-10}$	0.440837	1.23207	0.35780

Table 9. Error Correction Model for UK (Continued)

$lnIP_{t-11}$	0.238630	0.65564	0.36396
$lnIP_{t-12}$	0.168306	0.36750	0.36750
Intercept	-0.001742	-0.52417	0.00332
Adj. R^2= 0.063856,			
AIC = -3.349546,			
F-stat. = 1.364723,			

Table 10. Long run Modelfor UK

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1 error\ corection}$	-0.038979	-1.72767	0.0225
$lnOP_{t-1}$	0.025030	0.24411	0.10253
$lnIR_{t-1}$	0.089391	1.61053	0.05550
$lnIP_{t-1}$	-7.262904	-7.04461	1.03099
Intercept	25.06941		
Adj. R^2= 0.034936,			
AIC = -2.844900,			
F-stat. = 2.976549,			

5.3.2 Error Correction Model Estimation for Canada

Table 12 provided results of long term and error correction models in the case of the Canada at lag 2. Table 12 shows that the long term coefficients of lnIR is not statistically significant; but the long term coefficient of lnIP is statistically significant at the 0.01 level but is negative ($b = -6.689$, $p < 0.01$). This reveals that when industrial production changes by one percent, stock prices in the Canada will change by 6.689 percent negatively. It is interesting to see that movements in the industrial sector and stock markets in the Canada are in reverse directions. Moreover, we can observe that lnOP is statistically significant at the 0.01 level and is positive ($b = 7.416314$, $p < 0.01$). This means that when the oil price in the Canada changes by 1% the stock prices in this country will change by 7.416314 percent in the same direction. As a result, we can easily find out the positive relationship between oil price and stock price in the Canada.

When the short term coefficients are considered, it is seen that the coefficient of lnIR is statistically significant at the 0.10 level but is negative at lag 1 ($b = -0.0405$, $p < 0.10$); this suggests that the interest rate in the Canada exerts negative effects on stock markets in the shorter periods. It is seen from Table 11 that the other short term coefficients of the other variables are not statistically significant which denotes that short term movements in lnOP and lnIP do not exert statistically significant effects on lnSI. The error correction term of the model, SI = f (OP, IND, IR), in the case of the Canada is -0.022191, which is negative and statistically significant ($p < 0.05$) as expected (Gujarati, 2003). This reveals that the stock market in the Canada reacts to its long term equilibrium path by 2.219 percent speed of adjustment every month through the channels of oil prices, industrial production, and interest rates. This result shows that the regressors of lnOP, lnIR and lnIP contribute to lnSI to move to its long term equilibrium level.

If results are summarized for the case of the Canada, the model of SI = f (OP, IND , IR) is a long run model for the case of Canada and we can say that oil prices, interest rates, and industrial production in the Canada are long term contributors of the stock market movements.

Table 11. Error Correction Model for Canada

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1 error corection}$	-0.022191	-2.03272	0.01092
$lnSI_{t-1}$	0.166527	2.65968	0.06261
$lnSI_{t-2}$	0.042830	0.68748	0.06230
$lnOP_{t-1}$	0.155972	0.19813	0.78720
$lnOP_{t-2}$	0.097407	0.13124	0.74220
$lnIR_{t-1}$	-0.040540	-1.84362	0.02199
$lnIR_{t-2}$	0.001144	0.05180	0.02208
$lnIP_{t-1}$	-0.171038	-0.21764	0.78588
$lnIP_{t-2}$	-0.050774	-0.06852	0.74104
Intercept	0.002051	0.64638	0.00317
Adj. R^2= 0.032317, AIC = -3.420384, F-stat. = 2.009318,			

Table 12. Long run Model for Canada

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1 error correction}$	-0.022191	-2.03272	0.01092
$lnOP_{t-1}$	7.416314	5.63238	1.31673
$lnIR_{t-1}$	-0.167889	-1.62937	0.10304
$lnIP_{t-1}$	-6.689528	-5.71644	1.17023
Intercept	-11.37735		
Adj. R^2= 0.032317, AIC = -3.420384, F-stat. = 2.009318,			

5.3.3 Error Correction Model Estimation for U.S.A

Table 14 provided results of long term and error correction models in the case of the USA at lag 2. Table 14 shows that the long term coefficients of lnIR is statistically significant at the 0.05 level and is (b= 0.174641, $p < 0.05$). Also, the long term coefficient of lnIP is statistically significant at alpha=0.01 but is negative (b =-2.489112, $p < 0.01$). This reveals that when industrial production changes by one percent, stock prices in the USA will change by 2.4891 percent negatively. It is interesting to see that movements in the industrial sector and stock markets in the USA are in reverse directions. Moreover, we can observe that lnop is statistically significant at the 0.01 level and is negative (b = -0.772958, $p < 0.01$). This means that when the oil price in the USA changes by 1% the stock prices in this country will change by 77.2958 percent in the opposite direction. As a result, we can easily find out the reverse relationship between oil price and stock price in the USA.

When the short term coefficients are considered, it is seen that the coefficient of lnOP is statistically significant at the 0.10 level but is negative at lag 2 (b = -0.0447, $p < 0.10$); this suggests that oil price in the USA exerts negative effects on stock markets in the shorter periods. Also, it is obvious that the lnIR is statistically significant at the 0.01 level but is positive at lag 2 (b = 0.1138, $p < 0.01$); this suggests that interest rate in the USA exerts positive effects on stock markets in the shorter periods. Moreover, it is seen that the coefficient of lnIP is statistically significant at the 0.05 level but is positive at lag 2 (b = 0.9765, $p < 0.05$); this suggests that industrial production in the USA exerts positive effects on stock markets in the shorter periods.

The error correction term of the model, SI = f (OP, IND, IR), in the case of the USA is -0.025211, which is negative and statistically significant ($p < 0.01$) as expected (Gujarati, 2003). This reveals that the stock market in the USA reacts to its long term equilibrium path by 2.52 percent speed of adjustment every month through the channels of oil prices, industrial production, and interest rates. This result shows that the regressors of lnOP, lnIR and lnIP contribute to lnSI to move to its long term equilibrium level.

If results are summarized for the case of the USA, the model of SI = f (OP, IP, IR) is a long run model for the case of the USA and we can say that oil prices, interest rates, and industrial production in the USA are long term contributors of the stock market movements.

Table 13. Error Correction Model for U.S.A

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1 \text{ error correction}}$	-0.025211	-2.75670	0.00915
$lnSI_{t-1}$	0.103964	1.74334	0.05964
$lnSI_{t-2}$	-0.084945	-1.39720	0.06080
$lnOP_{t-1}$	0.034641	1.35121	0.02564
$lnOP_{t-2}$	-0.044755	-1.73259	0.02583
$lnIR_{t-1}$	-0.027682	-1.00024	0.02768
$lnIR_{t-2}$	0.113818	4.26638	0.02668
$lnIP_{t-1}$	-0.735561	-1.68751	0.43589
$lnIP_{t-2}$	0.976503	2.22726	0.43843
Intercept	0.003991	1.35004	0.00296
Adj. R^2= 0.100149, AIC = -3.428083, F-stat. = 4.363598,			

Table 14. Long run Model for U.S.A

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1 \text{ error correction}}$	-0.025211	-2.75670	0.00915
$lnOP_{t-1}$	-0.772958	4.18320	0.18478
$lnIR_{t-1}$	0.174641	2.35988	0.07400
$lnIP_{t-1}$	-2.489112	-4.60402	0.54064
Intercept	2.587240		
Adj. R^2= 0.100149, AIC =-3.428083, F-stat. =4.363598,			

5.3.4 Error Correction Model Estimation for France

Table 16 provided results of long term and error correction models in the case of the France at lag 1. Table 16 shows that the long term coefficients of lnIR is statistically significant at the 0.01 level and is (b=13.04188, $p < 0.01$). Also, the long term coefficient of lnIP is statistically significant (b = 94.19875, $p < 0.01$). This reveals that when industrial production changes by one percent, stock prices in the France will change by 9419.875 percent positively. The movements in the industrial sector and stock markets in the France are in same directions. Moreover, we can observe that lnOP is statistically significant at the 0.01 level and is negative ($b = -14.25293$, $p < 0.01$). This means that when the oil price in the France changes by 1% the stock prices in this country will change by 14.2529 percent in the reverse direction. As a result, we can easily find out the negative relationship between oil price and stock price in the France. When the short term coefficients are considered, it is seen that the coefficient of lnIR is statistically significant at the 0.05 level is negative at lag 1 ($b = -0.095923$, $p < 0.05$); this suggests that interest rate in the France exerts negative effects on stock markets in the shorter periods. The error correction term of the model, SI = f (OP, IP, IR), in the case of the France is -0.001016, which is negative and statistically significant ($p < 0.010$) as expected (Gujarati, 2003). This reveals that stock market in the France reacts to its long term equilibrium path by 0.1016 percent speed of adjustment every month through the channels of oil prices, industrial production, and the interest rates. This result shows that the regresses of lnOP, lnIR, and lnIP contribute to lnSI to move to its long term equilibrium level.

If results are summarized for the case of the France, the model of SI = f (OP, IP, IR) is a long run model for the case of the France and we can say that oil prices, interest rates, and industrial production in the France are very strong long term contributors of the stock market movements.

Table 15. Error Correction Model for France

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1 \text{ error correction}}$	-0.001016	-3.05770	0.00033
$lnSI_{t-1}$	0.065866	1.09089	0.06038
$lnOP_{t-1}$	-0.012474	-0.37562	0.03321
$lnIR_{t-1}$	-0.095923	2.45083	0.03914
$lnIP_{t-1}$	0.212074	0.73658	0.28792
Intercept	0.002495	0.70287	0.00355
Adj. R^2= 0.034936,			
AIC = -2.844900,			
F-stat. = 2.976549,			

Table 16. Long run Model for France

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1 \text{ error correction}}$	-0.001016	-3.05770	0.00033
$lnOP_{t-1}$	-14.25293	3.51043	4.06017
$lnIR_{t-1}$	13.04188	4.65783	2.79999
$lnIP_{t-1}$	94.19875	2.96865	31.7311
Intercept	-500.5210		
Adj. R^2= 0.034936,			
AIC = -2.844900,			
F-stat. = 2.976549,			

Chapter 6

CONCLUSION

6.1 Conclusion

This empirical study has investigated the impact of oil prices on the stock markets of U.K, Canada, U.S.A. and France. The variables applied in this thesis are; Oil price, industrial production and interest rate. Data used in this study is based on monthly time series from 1990:01 to 2012:12. Different approaches like unit root test, co-integration analysis and error correction model estimation has done for this study. The first aim of the study was to understand the behavior of oil producing and oil consuming countries. According to the results, the respond of stock prices in Canada as an oil producer was positive. The rest of the countries which were oil consumer respond to this change negatively.

Another important reason for volatility in stock price is inflation changes. When the oil price increases, the cost of production will go up and will affect the cash flow in the reverse direction which results stock price to decrease. When an economy encounters to the oil price volatility, the inflation rate in the country will increase, as a result the central bank will control this situation. The central bank increases the interest rate which will cause the investors put their money in the bank or buying bond rather than stock. As a result, stock price will decrease because of the decreasing in demand for the stock. In conclusion, we will see the negative relationship between the interest rate and stock price.

6.2 Recommendation

Based on the study, governments need to control the inflation changes that may emerge because of oil price volatilities. First of all the changes in inflation will induce the interest rates to change and will make the uncertainty regarding the cash flows. Changes in inflation also may induce companies to reduce their investments and limit job creation which can consequently harm economic growth. Secondly, the volatility in inflation will change the interest and cause changes in supply and demand of stock markets. Although in some periods inflation of a country is encountered to the increased oil price shock, it is the duty of the government to control the inflation core. At the end, in order to benefit from oil price movements and stock price changes, countries should manage oil production and oil consumption and enable them to contribute to the economy.

Moreover, investors must know how different stock markets react to the oil price changes. Also, it is important for investors to know which stock markets react positively and which ones react negatively. Stock market of Canada reacts to oil price changes positively while the other stock markets react negatively. At the end, as this study has also shown, we can suggest to the investors to invest in stock market of a country that are oil producer rather than oil consumer to reduce the effect of oil price changes on their stock markets. Also, they can improve their portfolios by choosing different stock from different countries.

REFERENCES

Al-Fayoumi, N. A., Khames, B. A., & Al-Thuneibat, A. A. (2009). Information transmission among stock return indexes: evidence from the Jordanian stock market. *International Research Journal of Finance and Economics, 24* , 1450-2887.

Aloui, C., & Jammazi, R. (2009). The effects of crude oil shocks on stock market shifts behaviour: a regime switching approach. *Energy Economics 31* , 789–799.

Anoruo, E., & Mustafa, M. (2007). An empirical investigation into the relation of. *North American Journal of Finance and Banking Research 1 (1)* , 22-36.

Arouri, M., & Fouquau, J. (2009). On the short-term influence of oil price changes on stock markets in GCC countries: linear and nonlinear analyses. *Economics Bulletin, AccessEcon 29* , 795-804.

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

Berk, I., & Aydogan, B. (2012). Crude oil price shocks and stock return: Evidence from Turkish stock market under global liquidity conditions. *EWI working papers. BP statistical review of world energy, June 2012 (www.BP.com)* .

Bodie, Z., Kane, A., & Marcus, A. J. (1996). *Investments, third ed. Richard D. Irwin,*. Englewood, NJ.

Cavallo, M., & Wu, T. (2006). Measuring Oil-Price Shocks using Market-Base Information. *Working Paper Series 28, Feredal Reserve Bank of San Francisco* .

Chang, Y., & Wong, J. F. (2003). Oil price fluctuations and Singapore economy. *Energy policy 31* , 1151-1165.

Chen, N. F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *Journal of business 59* , 383-403.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators of autoregressive time series with a unit root. *Journak of American Statistical Association, Vol 74, Issues 366* , 427-431.

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

Enders, W. (1995). *Applied Econometric Time Series.* John Wiley & sons, Inc,. U.S.A.

Engle, R., & Granger, C. (1987). Cointegration and error correction: representation, estimation and testing. *Econometrica 55* , 251-276.

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

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

Gounder, R., & Bartleet, M. (2007). Oil price shocks and economic growth: Evidence for New Zealnad 1986-2006. *paper presented at the New Zealand Association of Economist Annual Conference Christchurch, 27th to 29th June* .

Gujarati, D. N. (2003). Basic Econometrics, 4th edn. *New York: McGraw-Hill International* .

Hamilton, J. D. (2011). Historcal Oil Shocks. *Prepared for handbook of major events in economic history* .

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

Jbir, R., & Zouari-Ghorbel, S. (2009). Recent oil price shock and Tunisian economy. *Energy Policy 37* , 1041-1051.

Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Interface on Co-Integration with Application to the Demand for Money. *Oxford Bulletin of Economics and Statistics 52* , 169-209.

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

Katırcıoğlu, S. (2010). International Tourism, Higher Education, and Economic Growth: the Case of North Cyprus. *The World Economy 33* , 1955-1972.

Laurenceson, J., & Chai, J. (2003). Financial Reform and Economic Development in China, Cheltenham, UK and Norththampton, MA, USA: Edward Elgar.

Lee, Y., & Chiou, J. (2011). Oil Sensitivity and its asymmetric impact on the stock market. *Energy 36* , 168-174.

Maghyereh, A. (2004). Oil price shock and emerging stock markets: A Generalized VAR Approach. *International Journal of Applied Econometrics and Quantitative Studie Vol.1-2* , 27-40.

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

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

Newey, W., & West, K. D. (1987). A Simple, Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica, vol. 55, issue 3* , 703-08.

Ono, S. (2011). Oil price shocks and stock markets in BRICs. *The European Journal of Comparative Economics 8* , 29-45.

Onour, A. (2007). Impact of oil price volatility on Gulf Cooperation Council stock markets' return. *OPEC Review Volume 31, Issue 3* , 171–189.

Organization for Economic Co-operation and Development. (2013). Retrieved from http://www.oecd.org/

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

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

Pesaran, M. H. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics 16* , 289-326.

Phillips, P., & Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrica 75* , 335-346.

Roll, R. R., & Ross, S. A. (1980). An Empirical Investigation of the Arbitrage Pricing Theory. *Journal of Finance, 35* , 1073–1104.

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