Radboud University Nijmegen

Effect of Oil Price Changes on Stock Market Returns: an ARDL Approach

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ABSTRACT

This thesis studies the effect of oil price changes and the stock market returns in 26 countries comprising oil exporter and importer as well as developed and developing countries covering period of January 2000 to March 2016. Using ARDL approach, bound test results show the existence of a long-run relationship between excess stock market returns, oil price changes and other explanatory variables in all countries. The study discovers that oil price changes have significant negative long-term effect on stock market returns in oil importing countries except Austria, Netherlands and South Africa. On the other hand, oil price changes influence stock market returns positively and significantly in the long run in oil exporting countries. Meanwhile, the level of development of country found to be unrelated towards the magnitude of the relationship.

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1. Introduction

Oil is an important resource in modern economics. It can be said that oil powers the earth as it is the major source of energy. Individuals need oil to power their cars, and from the production standpoint, industries use it to drive production; and furthermore, some countries rely on export of oil and petroleum products for their income. Oil prices did not fluctuate much before 1970's. Back then, oil cartel comprising few large oil companies known as the Seven Sisters dominated global oil industries and stabilized the price through price and production controls throughout much of the 20th century. However, after the Yom Kippur War started on 1973, control over crude oil prices largely influenced by Organization of the Petroleum Exporting Countries (OPEC) cartel. Since then oil prices started to behave like the prices of other commodities. In addition to global demand and supply conditions, oil prices also respond to geopolitics, institutional arrangements (OPEC) and the dynamics of the futures market (Sadorsky, 2004). More recently, world has experienced sharp fall in oil price, in 11th of February 2016, it plunged to $26.21 per barrel, the lowest point since 2003.

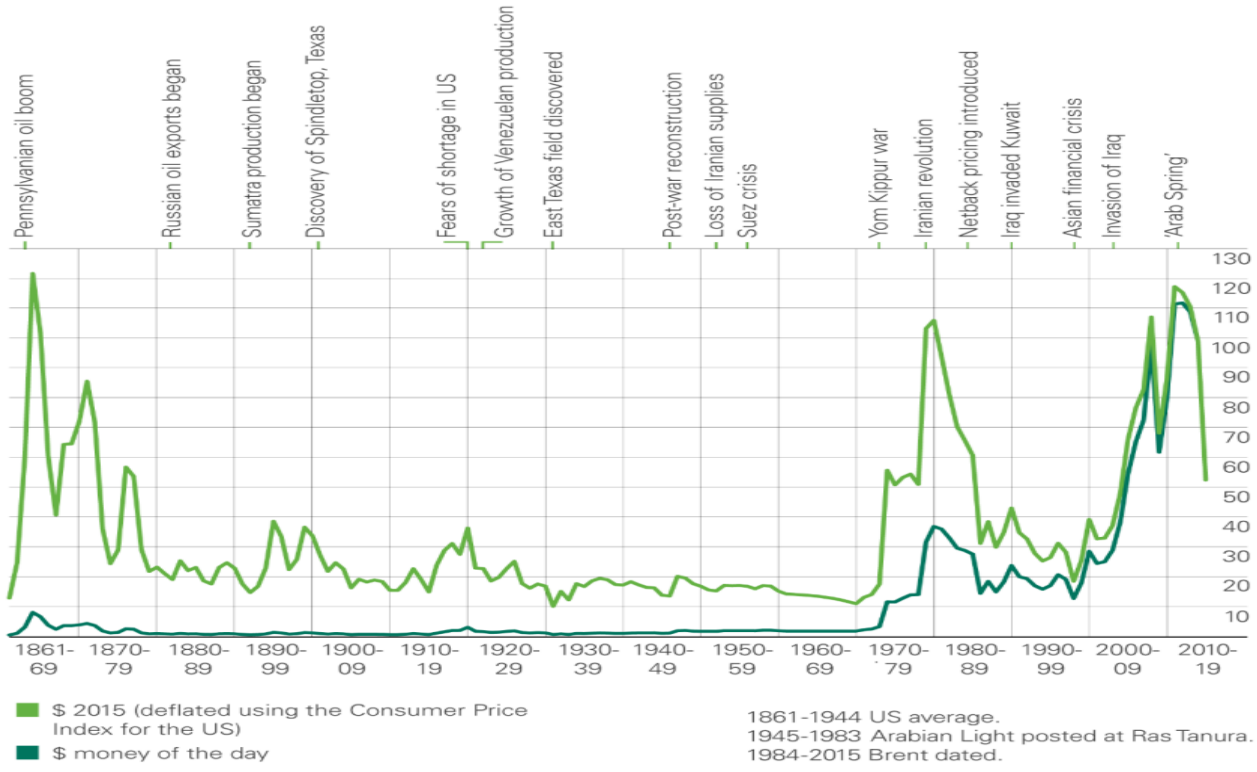

Figure 1 – Historical prices of crude oil (source: BP)

Due to the failure of capital asset pricing model which states that assets are priced according to their covariance with the market portfolio, other factors, especially macroeconomic factors, is increasingly accepted and relevant to the model, most notably in the form of the arbitrage pricing theory (McSweeney and Worthington, 2008). One such factor that is getting considerable attention is the price of crude oil. As a vital input in production, the crude oil price potentially can influence the financial performance of firms and thus, collectively, national economy as a whole. Moreover, oil price shocks could influence stock prices through affecting expected cash flows and/or discount rates (Hasan and Ratti, 2012).

The purpose of this study is to explore if changes in oil prices influence stock returns in 26 selected countries and compare the relationship across those countries. They are: Australia, Austria, Belgium, Brazil, Canada, China, France, Germany, India, Indonesia, Japan, Malaysia, Mexico, Netherlands, Nigeria, Norway, Qatar, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Switzerland, Turkey, United Kingdom, United States of America and Venezuela.

There have been substantial studies on the relationship of oil prices and economic performance. An extensive review of the literature is provided below. This study potentially contributes to existing and growing research in relationship between stock market and oil prices as it will offer country comparison on the effect of oil price changes on stock returns. Also it expects to capture the role of oil price on stock market return based on the nature of oil in economy (oil export & import) as well as the nature of economic development (developed and developing economies). This thesis will be organized as follows. Section 2 presents the review of the literature. Section 3 discusses the status of selected countries regarding their oil dependence. Section 4 presents data and methodology. Subsequently, section 5 and 6 will show empirical results and conclusion respectively.

2. Literature Review

The fluctuation in oil prices has generated a lot of research interest in the relationship between oil prices, financial markets and the economy in general. Various researches have contributed to provide an extensive perspective in the analysis of relationships between oil price and economics performance. The pioneering study by Hamilton (1983) supports oil price shocks

as a factor contributing to recession in the United States. He found that all US recessions but one in post-World War II period have been preceded by an increase in the oil price.

Since then, growing number of studies have analyzed the interrelation between macroeconomic activity and oil price changes. Gross domestic product (GDP) is one of the most analyzed macroeconomic factors to have been studied in terms of its relationship with the oil price, for instance, study showed an inverse relationship between oil price and GDP (Darby, 1982; Hamilton, 1983; Darrat et al., 1996). Furthermore, Jones et al. (2004) report that an oil price shocks influenced GDP by approximately −0.06 in terms of elasticity. Papapetrou (2001) analyzes the dynamic relationship among oil prices, real stock prices, interest rates, real economic activity and employment in Greece and found that the oil price shocks have negative effect on industrial production, employment and share prices.

Generally, studies have found that oil price increases have a negative impact on output, despite seemingly to have weakened over time, especially since the late 1990s. Blanchard and Gali (2007) find that the effects of oil price shocks have changed over time, with steadily smaller effect on macroeconomic variables in recent years. Among plausible causes are the decreased real wage rigidities, the increased credibility of monetary policy and that the effects of oil price shocks must have coincided in time with large shocks of a very different nature, such as large increases in other commodity prices in the 1970s, and high growth of productivity and world demand for oil in the 2000s.

Despite abundance studies showing that oil price shocks have significant effects on economics performance, relatively less work has appeared on the relationship between oil prices and stock markets. This line of research is getting considerable interests recently as growing literature is published in this issue.

Among the earliest of researchers on this topic are Jones and Kaul (1996) who test if the reaction of international stock markets to oil shocks can be justified by current and future changes in real cash flows, by using a standard cash-flow/dividend valuation model, they found that the reaction of Canadian and US stock prices to oil price shocks can be completely accounted for by the impact of these shocks on real cash flows. However, the results for Japan

and the UK are not as strong. Sadorsky (1999) reported that positive shocks to oil prices depress real stock returns and that the magnitude of that effect is significantly stronger after 1986.

In contrast, Huang et al. (1996) who used a vector autoregression (VAR) approach to investigate the relationship between daily oil futures returns and daily US stock returns found that oil futures returns do not have a significant connection with general U.S. stock market returns, except in the case of oil company stock returns. However, Ciner (2001) argued that that this conclusion is due to the fact that Huang et al. focus solely on linear dependencies and tests that they rely on are not powerful enough to detect nonlinear linkages. Using the same data set, Ciner finds significant relationship between real stock returns and oil price futures, but that the connection is non-linear. The study also finds that stock index returns affect oil futures markets, suggesting a feedback relation, especially in the 1990s. In more recent paper, Nandha and Faff (2008) examine 35 DataStream global industry indices for the period from April 1983 to September 2005 and found that oil price rises have a negative impact on stock returns for all sectors except the mining, and oil and gas industries.

Furthermore, most of the literatures on oil price-stock markets relationship have been concentrated on developed countries where most of study found oil price increases adversely affect stock returns. O'Neil et al. (2008) studied United States, the United Kingdom and France, Aloui and Jammazi's (2009) studied France, UK and Japan, Arouri (2011) investigated the European stock market indices, Apergis and Miller (2009) studied in eight developed countries, Hasan and Ratti (2012) studied Australia and Park and Ratti (2008) estimate the effects of oil price shocks and oil price volatility on the real stock returns of the U.S. and 13 European countries.

While most of the research investigating oil prices and stock prices the relationship has been done in developed economies, there are also some studies looking into the relationship between oil prices and emerging stock markets. The general consensus of the study is that oil price changes has also influenced the stock returns in emerging countries (Basher and Sadorsky, 2006; Basher et al., 2011; Eryigit, 2012; Berka and Aydogan, 2012; Shammas, 2012) with the exception of Maghyereh (2004) who examines the dynamic linkages between oil price and stock market returns for 22 emerging economies for the period of 1998 to 2004 by using VAR analysis and the findings imply that oil shocks have no significant impact on emerging economies stock

index and Cong et al. (2008) who find that oil price shocks do not show a statistically significant impact on the real stock returns of most Chinese stock market indices, except for manufacturing index and some oil companies.

Considerable numbers of papers also have focused on the effect of oil price shocks on the returns of the oil and gas sector which generally shows returns of oil and gas stocks have positive relationship with the price of crude oil (Sadorsky, 2001; El-Sharif et al., 2005; Aleisa et al., 2003; Lanza et al., 2005; McSweeney and Worthington, 2008; Dayanandan and Donker, 2011), with the exception of Mohanty et al. (2010) who analyze the relation between oil prices and the stock returns of oil and gas firms in five Central and Eastern European (CEE) countries. The industry level analysis and firm-level analysis show no significant relation between equity values of oil and gas companies and oil prices throughout sample period (December 1998–March 2010).

Several studies also focus in terms of oil exporting countries which often concentrated on Gulf Cooperation Council (GCC) countries and oil importing countries. Most of studies suggest that higher oil price increases stock returns in oil-exporting country and decreases returns in oil-importing country (Bjornland, 2008; Filis et al., 2011; Fayyad and Daly. 2010; Arouri et al., 2011; Hammoudeh and Aleisa, 2004; Onour, 2010; Arouri and Fouquau, 2009 and Creti et al., 2014).

All in all, it can be stated that there is a relationship between oil price and stock market returns. Compared to most studies that concentrated on specific and developed countries, this study will examine 26 countries that will consist of developing and developed countries as well as oil exporter and importer to better capture the relationship. Thus, the interesting outcome of this study is cross-country comparison of the effect of oil price changes on stock returns.

3. Oil dependence

In this chapter, countries in study will be examined in terms of its status regarding whether it is an oil exporting or importing countries. It also shed a light regarding each country's oil production and consumption. All of the oil related data are based on the US Energy Information Administration (EIA). All of the graphs of each country's oil exports and imports as well as oil production and consumption can be seen in appendix.

TABLE 1 – Economic Indicators (World Bank 2015)

	GDP (current US$) (billions)	GDP growth (annual %)	Inflation, GDP deflator (annual %)	GNI, Atlas method (current US$) (billions)	GNI per capita, Atlas method (current US$)	FDI, net inflows (BoP, current US$) (millions)	GDP Structure
Australia	1,339.54	2.3	-0.6	1,428.65	60,070	36,852	Agriculture: 2% Industry:27% Services: 70%
Austria	374.06	0.9	1.6	405.72	47,120	5,747	Agriculture: 1% Industry:28% Services: 71%
Belgium	454.04	1.4	0.9	500.60	44,360	9,934	Agriculture: 1% Industry:22% Services: 77%
Brazil	1,774.72	-3.8	8	2,047.11	9,850	75,07	Agriculture: 5% Industry:23% Services: 72%
Canada	1,550.54	1.1	-0.6	1,702.89	47,500	63,171	Agriculture: 2% Industry:29% Services: 69%
China	10,866.44	6.9	-0.5	10,723.96	7,820	249,859	Agriculture: 9% Industry:41% Services: 50%
France	2,421.68	1.2	1.2	2,711.41	40,580	25,195 (2014)	Agriculture: 2% Industry:20% Services: 79%
Germany	3,355.77	1.7	2.1	3,727.76	45,790	46,227	Agriculture: 1% Industry:30% Services: 69%
India	2,073.54	7.6	1	2,084.45	1,590	44,208	Agriculture: 17% Industry:30% Services: 53%
Indonesia	861.93	4.8	4.2	887.03	3,440	15,508	Agriculture: 14% Industry:40% Services: 43%
Japan	4,123.26	0.5	2	4,656.38	36,680	-42	Agriculture: 1% Industry:27% Services: 72%
Malaysia	296.22	5	-0.4	320.67	10,570	10,963	Agriculture: 8% Industry:39% Services: 44%
Mexico	1,144.33	2.5	2.5	1,233.66	9,710	30,285	Agriculture: 4% Industry:33% Services: 64%
Netherlands	752.55	2	0.4	828.80	48,940	68,733	Agriculture: 2% Industry:21% Services: 78%
Nigeria	481.07	2.7	2.9	514.03	2,820	3,064	Agriculture: 21% Industry:20% Services: 59%
Norway	388.31	1.6	-2.3	487.50	93,820	-9,923	Agriculture: 2% Industry:35% Services: 63%
Russia	1,326.02	-3.7	7.7	1,668.65	11,400	4,839	Agriculture: 5% Industry:33% Services: 63%
Saudi Arabia	646.00	3.5	-17.2	742.71	23,550	8,141	Agriculture: 2% Industry:46% Services: 52%
Singapore	292.74	2	1.6	288.31	52,090	65,263	Agriculture: 0% Industry:25% Services: 75%
South Africa	312.80	1.3	3.8	332.59	6,050	1,575	Agriculture: 2% Industry:29% Services: 69%
South Korea	1,377.87	2.6	2.2	1,388.99	27,440	5,042	Agriculture: 2% Industry:38% Services: 60%
Switzerland	664.74	0.9	-1.3	697.63	84,180	119,714	Agriculture: 1% Industry:26% Services: 74%
Turkey	718.22	4	7.5	783.00	9,950	16,819	Agriculture: 9% Industry:26% Services: 65%
UK	2,848.76	2.3	0.3	2,823.30	43,340	39,533	Agriculture: 1% Industry:20% Services: 79%
US	17,947.00	2.4	1	17,663.59	54,960	7,088	Agriculture: 1% Industry:21% Services: 78%
Venezuela	371.34 (2013)	-5.7	35.5 (2013)	356.68 (2013)	11,780 (2013)	3,764	Agriculture: 5% Industry:49% Services: 46%

3.1 Australia

Australia is world's tiniest continent but sixth-largest country. The former British colony federated and became the Commonwealth of Australia in 1901. With its abundance natural resources, Australia rapidly developed agricultural and manufacturing industries. Australia's GDP in 2015 amount to 1,339.54 billion US dollars, out of which 70% comes from services, 27% and 2% originates from industry and agriculture respectively. GDP growth in 2015 is 2.3% and inflation reached -0.6%. In terms of oil export and import position, both of Australia's oil export and import increased gradually since 1986. Notable sharp increase of oil export could be seen in 2000 when export surpassed import. All in all, it can be said that throughout the period since 1986, Australia is net oil importer except in 2000 which is the only time oil export exceeded import. Regarding oil consumption and production, Australia's oil consumption had been on steady rise and the amount at 2014 is approximately double of 1980 amount. Moreover, oil production fluctuated throughout period where in 2014 reached similar amount of the 1980 quantity.

3.2 Austria

Following Germany's defeat in World War II and then occupation by the victorious Allies, 1955 State Treaty ended the occupation and recognized Austria's independence. Austria is member of European Union since 1995 and also one of the founding members of the Organization for European Economic Cooperation (OECD). In 2015 Its GDP reached 374.06 billion US$ in GDP and 0.9% in GDP growth. The agriculture, industry, and service sectors contributes to 1%, 28% and 71% of the GDP respectively. Furthermore, Austria's oil import remained stable throughout the period where the value lies between 130 and 180 thousand barrels per day. Similarly, oil consumption also remained constant in the range of 200 to 300 thousand barrels per day.

3.3 Belgium

Belgium is a country in West Europe, it gained independence from the Netherlands in 1830 and shares borders with France, Germany, Luxembourg and the Netherlands. Its GDP and GDP growth reached 454.04 billion US$ and 1.4% in 2015. Whereas, agriculture, industry, and service sectors contributes to 1%, 22% and 77% of the GDP respectively. As it can be seen from the graphs, Belgium is an oil importer country, it imported in the range of 500 to 800 thousand barrels of oil per day since 1986, while the highest oil export recorded in 2012 when it exported around 99

thousand barrels per day. Meanwhile, oil consumption in Belgium had been on steady rise since 1984 and achieved approximately 630 thousand barrels per day in 2014.

3.4 Brazil

Brazil is the largest country in South America and also world's fifth-largest country by area and population. It gained independence in 1822 from Portugal. It is also a founding member of United Nations, G20 and BRICS. Brazil's GDP amount to 1,774.72 billion US$ in 2015 and -3.8% growth rate. Service sectors contribute most to the GDP with 72%, followed by industry and agriculture sectors with 23% and 5% respectively. Moreover, Brazil's oil exports had been on sharp increase since 2001 up to 2010 when it reached peak of 630 thousand barrels before decreasing to 530 thousand barrels per day in 2012. Its oil imports declined gradually since 1986 and was surpassed by exports in 2006. Between 1986 and 2007, Brazil had been net importer of oil, whereas, it has become net oil exporter in 2008 and onwards. This study will regard Brazil as net exporter due to its more recent status. Furthermore, oil production and consumption had grown steadily since 1980 and consumption surpassed production in all the periods.

3.5 Canada

Canada is a country in North America and shares world's longest land border with United States of America. Canada's GDP reached 1,550.54 billion US$ in 2015 and 1.1% growth rate. The agriculture, industry, and service sectors contributes to 2%, 29% and 69% of the GDP respectively in 2014. Canada is a net oil exporter country, its oil export raised sharply since 1986 and in 2013 reached almost 4 times of the 1986 quantity. On the other hand, its oil import declined since 2000 after slight increase on previous periods before that. Furthermore, both oil production and consumption had been on the rise after slight decrease in the beginning of the 80s. The oil production enjoyed sharper rise and surpassed consumption since 2001.

3.6 China

China is the most populous nation with over 1.381 billion population and is one of the largest economies in the world. Its GDP amounts to 10,866.44 billion US$ in 2015 and 6.9% growth rate. The agriculture, industry, and service sectors contributes to 9%, 41% and 50% of the GDP respectively. Throughout the periods, China's oil import had been on the climb, particularly

since 2000 when significant surge occurred. Furthermore, both oil production and consumption increased with consumption experienced more dramatic growth and exceeded production since 1993.

3.7 France

France is a country located in West Europe, it is permanent member of the UN Security Council, NATO, G-8, G-20 and the EU. Its GDP amounts to 2,421.68 billion US$ in 2015 and 1.2% growth rate. The agriculture, industry, and service sectors contributes to 2%, 20% and 79% of the GDP respectively. France is an oil importer country, its oil import and consumption had been steady over the period. Recent oil imports amounted to 1.13 million barrels in 2013 and oil consumption reached 1.7 million barrels per day in 2014.

3.8 Germany

Germany is Europe's largest economy and the continent's second most populous nation. It is one of the founding members of the EU and also a member of NATO, G8, G20, and OECD. Its GDP amounts to 3,355.77 billion US$ in 2015 and 1.7% growth rate. The agriculture, industry, and service sectors contributes to 1%, 30% and 69% of the GDP respectively. As can be seen from the graphs, Germany is an oil importer country, its oil import remained consistent over the years which was in the range of 1.8 to 2.3 million barrels per day. Moreover, its oil consumption declined slightly since 1998 after a modest increase in the years before that.

3.9 India

India is a country in South Asia and the world's second-most populous country with over 1.2 billion people. India is also considered as one of the fastest growing economies, its GDP amounts to 2,073.54 billion US$ in 2015 and 7.6% growth rate. The agriculture, industry, and service sectors contributes to 17%, 30% and 53% of the GDP respectively. India's oil import had been on modest increase between 1986 and 1998, followed by notable substantial growth in 1999 onwards and in 2012 oil imports reached approximately 3.7 million barrels/day. Furthermore, its oil production remained steady during the periods, while oil consumption soared from 650 thousand barrels in 1980 to 3.6 million barrels/day in 2013.

3.10 Indonesia

Indonesia is a country located in Southeast Asia It is the fourth most populous country with over 250 million populations and is one of founding members of Association of Southeast Asian Nations (ASEAN) and member of G-20. Its GDP amounts to 861.93 billion US$ in 2015 and 4.8% growth rate. The agriculture, industry, and service sectors contributes to 14%, 40% and 43% of the GDP respectively. Indonesia's oil export had been declining throughout the period, its value stood at 296 thousand barrels/day in 2012 compared to 900 thousand barrels/day in 1986. On the other hand, oil import climbed substantially during the periods and surpassed oil export in 2010. Moreover, similar trends can be observed regarding oil production and consumption, where oil production dropped and conversely, oil consumption went up and exceeded oil production quantity in 2004. In this study, Indonesia will be regarded as net exporter due to greater number of years of its net oil exporter position in the study period.

3.11 Japan

Japan is an islands country situated in East Asia. Following its defeat in World War II, Japan has recovered and improved to become an economic power. It is also member of the UN, G7, G8, and G20. Its GDP amounts to 4,123.26 billion US$ in 2015 and 0.5% growth rate. The agriculture, industry, and service sectors contributes to 1%, 27% and 72% of the GDP respectively. As can be seen from the graphs, Japan is an oil importer country, its oil import remained stable over the years which is in the range of 3.2 to 4.7 million barrels per day. Moreover, similar observation can be said about its oil consumption where it remained in the range of 4.5 to 5.7 million barrels per day throughout the periods.

3.12 Malaysia

Malaysia is a country situated in Southeast Asia. It gained independence from the British rule in 1957. It is also a founding member of ASEAN. Its GDP amounts to 296.22 billion US$ in 2015 and 5% growth rate. The agriculture, industry, and service sectors contributes to 8%, 39% and 44% of the GDP respectively. Malaysia's oil export had dropped since 1991 after slight increase in previous periods, while oil imports climbed significantly after 1999 following static trend in previous periods. Meanwhile, oil production surged between 1981 and 1998 which

followed by fluctuation and subsequent decline towards 2014, whereas oil consumption soared during all years and exceeded oil production quantity in 2010.

3.13 Mexico

Mexico is a country located in southern part of North America. It gained independence from Spain in 1821. Its GDP amounts to 1,144.33 billion US$ in 2015 and 2.5% growth rate. The agriculture, industry, and service sectors contributes to 4%, 33% and 64% of the GDP respectively. Mexico's oil export had been on the rise between 1995 and 2003 after periods of constant in prior years and then followed by sharp decline towards 2009, slight increase in 2010 and then slipped back until 2013. Furthermore, oil production had been fluctuating with generally positive trend during 1980 to 1993 period and then followed by substantial drop until 2013, whereas oil consumption climbed during all years but did not surpass oil production size.

3.14 Netherlands

Netherlands is a country located in northwestern Europe. Kingdom of the Netherlands was formed in 1815 and they became a prominent naval and trade power, with settlements and colonies around the world during the 17th century. It is also one of the founding members of NATO and the EU. Its GDP amounts to 752.55 billion US$ in 2015 and 2% growth rate. The agriculture, industry, and service sectors contributes to 2%, 21% and 78% of the GDP respectively. Netherlands is an oil importer country, its oil import and consumption had been steady over the years. Recent oil imports amounted to 1.2 million barrels per day in 2013 and oil consumption reached 1 million barrels per day in 2013.

3.15 Nigeria

Nigeria is a country located in West Africa and it is Africa's most populous country. It is a member of the Commonwealth of Nations, the African Union and OPEC. Its GDP amounts to 481.07 billion US$ in 2015 and 2.9% growth rate. The agriculture, industry, and service sectors contributes to 21%, 20% and 59% of the GDP respectively. Nigeria is an oil exporter country, its oil export had positive trends since 1989 despite few slight drops, recent oil exports reached to 2.4 million barrels per day in 2013. Similarly, after fluctuations between 1980 and 1986, oil production had been on the rise since 1987 with considerable decline in 2005-2008.

3.16 Norway

Norway is a country located in western of Scandinavian Peninsula. It has abundance reserves of oil and gas since its discovery in the late 1960s. Its GDP amounts to 388.31 billion US$ in 2015 and 1.6% growth rate. The agriculture, industry, and service sectors contributes to 2%, 35% and 63% of the GDP respectively. As it can be seen from graph below, Norway is an oil exporter country, its oil export improved significantly between 1986 and 1997 and then started declining until 2013 which was at 1.18 million barrels per day after it reached peak 3.2 million barrels per day in 2003. Similarly its oil production shares similar trends, it increased significantly between 1980 and 1996 and then started decreasing until 2014 when it reached 1.57 million barrels per day.

3.17 Russia

Russia is a transcontinental country located in Eurasia and is the world's largest country. Its GDP amounts to 1,326 billion US$ in 2015 and -3.7% growth rate. The agriculture, industry, and service sectors contributes to 5%, 33% and 63% of the GDP respectively. As it can be seen from graph, Russia is an oil exporter country, its oil export increased substantially between 1993 and 2004 and then followed by modest declines until 2012 when it reached 4.8 million barrels per day. While its oil production decreased in 1993 until 1998 and followed by periods of substantial rise towards 2014. Its oil consumption declined between 1982 and 1995 and then remained in the range of 2.6 and 3.5 million barrels per day in 1996 to 2014.

3.18 Saudi Arabia

Saudi Arabia is a country located in Arabian Peninsula and the Kingdom was founded in 1932. It is also member of the Organization of Islamic Cooperation (OCC), GCC and OPEC. Its GDP amounts to 646 billion US$ in 2015 and 3.5% growth rate. The agriculture, industry, and service sectors contributes to 2%, 46% and 52% of the GDP respectively. Saudi Arabia is an oil exporter country, its oil export increased substantially between 1989 and 1991 and then followed by slight fluctuation with general positive trend, its oil export amounted to 7.7 million barrels per day in 2012. Meanwhile, after sudden drop during 1980 to 1985, its oil production picked up the pace and increased its quantity until in 2014 when it reached the same level around 1980 value at around 9.7 million barrels per day.

3.19 Singapore

Singapore is an island city-state located in Southeast Asia. It was a British trading colony in 1819 and it joined the Malaysian Federation in 1963 but got separated due to ideological differences and became independent two years later. By focusing on trade, Singapore rapidly developed despite lack of natural resources. Its GDP amounts to 292.74 billion US$ in 2015 and 2% growth rate. The industry and service sectors contribute to 25% and 75% of the GDP respectively. Singapore's oil import fluctuated over the years but remained in the range of 700 and 1,000 thousand barrels per day. Moreover, its oil consumption had been on gradual rise from 200 thousand barrels in 1980 to 1.2 million barrels per day in 2013.

3.20 South Africa

South Africa is a country situated on the southernmost tip of the African continent. Its GDP amounts to 312.8 billion US$ in 2015 and 1.3% growth rate. The agriculture, industry, and service sectors contributes to 2%, 29% and 69% of the GDP respectively. South Africa is an oil importer country, its oil import fluctuated throughout the periods but with generally positive trend, it went up from 250 thousand barrels in 1986 to 426 thousand barrels per day in 2012. Meanwhile, its oil consumption increased modestly from 324 in 1980 to 612 thousand barrels per day in 2013.

3.21 South Korea

South Korea is a country situated in East Asia on the southern half of the Korean Peninsula. Its GDP amounts to 1,377.87 billion US$ in 2015 and 2.6% growth rate. The agriculture, industry, and service sectors contributes to 2%, 38% and 60% of the GDP respectively. South Korea is an oil importer country, as it can be seen from graph, its oil imports had been on steady increase where the 2013 value is almost triple of the 1986 value. Similarly, the oil consumption also increased steadily over the years and that the 2013 quantity is almost triple of the 1980 quantity.

3.22 Switzerland

Switzerland is a country situated in Central Europe. It shares borders with Italy, France, Germany, Austria and Liechtenstein. Its GDP amounts to 664.74 billion US$ in 2015 and 0.9% growth rate. The agriculture, industry, and service sectors contributes to 1%, 26% and 74% of the

GDP respectively. Switzerland is an oil importer country, as it can be seen from graph, its oil imports remained stable between 65 and 114 thousand barrels per day from 1986 to 2013. Similarly, the oil consumption also stayed constant in the range of 227 and 300 thousand barrels per day from 1980 to 2014.

3.23 Turkey

Turkey is a nation spanning from East Europe to West Asia. The republic founded in 1923 following dissolution of the Ottoman Empire. It joined the UN in 1945 and NATO in 1952. Its GDP amounts to 718.22 billion US$ in 2015 and 4% growth rate. The agriculture, industry, and service sectors contributes to 9%, 26% and 65% of the GDP respectively. As it can be seen from graph, Turkey is an oil importer country, its oil imports fluctuated over the periods, the lowest quantity recorded at 286 thousand barrels per day in 2009, while the peak was at 500 thousand barrels per day in 1995. Meanwhile, the oil consumption grew from 314 thousand barrels per day in 1981to 710 thousand barrels per day in 2014.

3.24 United Kingdom

United Kingdom is a monarch state located in the north-western coast of the European mainland. It is one of the members of the UN Security Council and a founding member of NATO and the Commonwealth. Its GDP amounts to 2,848.76 billion US$ in 2015 and 2.3% growth rate. The agriculture, industry, and service sectors contributes to 1%, 20% and 79% of the GDP respectively. UK’s oil exports generally had negative trend, in spite of periods of growth between 1992 and 2000, the value experienced dramatic decreases before and after those periods, it reached 703 thousand barrels per day in 2013. After periods of up and down, its oil import increased steadily since 1999 and surpassed oil export in 2005. Therefore UK will be considered as net importer of oil due to higher number of years it experienced said status during periods of the study. Meanwhile, oil production dropped since 1999 after fluctuating in previous periods and surpassed by oil consumption in 2005 and onwards.

3.25 United States of America

United States is a federal republic located in central North America between Canada and Mexico. Following victories in World Wars I and II and dissolution of the Soviet Union in 1991, the US considered as the world's most powerful nation. Its GDP amounts to 17,947 billion US$ in 2015 and 2.4% growth rate. The agriculture, industry, and service sectors contributes to 1%, 21% and 78% of the GDP respectively. US' oil imports climbed modestly between 1986 and 2007, then followed by slight drop and reached 9 million barrels per day in 2013. Oil consumption increased gradually from 1982 to 2007 and then reduced slightly and amounted to 19 million barrels per day in 2014. Furthermore, US' oil production had been on gradual decline up until 2008 when it began to rise slightly to reach its starting quantity of 1980 in 2013.

3.26 Venezuela

Venezuela is a nation situated in northern part of South America and one of the founding members of OPEC. It gained full independence in 1830. Its GDP amounts to 371.34 billion US$ in 2013 and -5.7% growth rate. The agriculture, industry, and service sectors contributes to 5%, 49% and 46% of the GDP respectively. Venezuela's oil export enjoyed dramatic increase from 1989 to 1998, which then followed by sharp decline until 2004 with slight rise from 1999 to 2000. After that, 2004 to 2005 saw sudden steep surge before plummeted again until 2011. Meanwhile, its oil production experienced fluctuations over the years, a decrease from 1980-1985, followed by sharp increase until 1997, slight decrease until 1999, slight increase towards 2000, dramatic fall until 2003 then went up slightly in 2004 and remained stable until 2014 when it reached 2.5 million barrels per day. While, oil consumption only climbed very slightly from 400 thousand barrels in 1980 to 746 thousand barrels per day in 2013.

4. Data & Methodology

The datasets of this study cover period from January 2000 to March 2016 in 26 countries as the table below shows. As it can be seen, the group of countries comprises of oil exporter and importer as well as developed and developing countries. All the data of the variables used are derived from DataStream and analyzed by Stata software programme.

Table 2- Profiles of Sample Countries in Study

Country	Oil Exporter or Importer	Developed or Developing	Stock Index
Australia	Net Importer	Developed	S&P/ASX 200
Austria	Importer	Developed	ATX
Belgium	Importer	Developed	BEL 20
Brazil	Net Exporter	Developing	BRAZIL BOVESPA
Canada	Net Exporter	Developed	S&P/TSX COMPOSITE
China	Importer	Developing	SHANGHAI SE A SHARE
France	Importer	Developed	FRANCE CAC 40
Germany	Importer	Developed	DAX 30 PERFORMANCE
India	Importer	Developing	NIFTY 500
Indonesia	Net Exporter	Developing	IDX COMPOSITE
Japan	Importer	Developed	TOPIX
Malaysia	Net Exporter	Developing	FTSE BURSA MALAYSIA KLCI
Mexico	Exporter	Developing	MEXICO IPC (BOLSA)
Netherlands	Importer	Developed	AEX ALL SHARE
Nigeria	Exporter	Developing	NIGERIA ALL SHARE
Norway	Exporter	Developed	OSLO EXCHANGE ALL SHARE
Russia	Exporter	Developing	RUSSIA RTS INDEX
Saudi Arabia	Exporter	Developing	SAUDI TADAWUL ALL SHARE (TASI)
Singapore	Importer	Developed	STRAITS TIMES INDEX L
South Africa	Importer	Developing	FTSE/JSE ALL SHARE
South Korea	Importer	Developed	KOREA SE COMPOSITE (KOSPI)
Switzerland	Importer	Developed	SWISS MARKET (SMI)
Turkey	Importer	Developing	BIST NATIONAL 100
United Kingdom	Net Importer	Developed	FTSE 100
United States	Importer	Developed	S&P 500 COMPOSITE
Venezuela	Exporter	Developing	VENEZUELA SE GENERAL

4.1. Model Specification

To investigate the relationship between oil prices and stock returns, models are constructed. The two-factor version of the model popular in prior related studies (Jorion, 1990; Khoo, 1994; Faff and Chan, 1998; Faff and Brailsford, 1999; Sadorsky, 2001; Sadorsky and Henriques, 2001; El-Sharif et al., 2005, cited in McSweeney and Worthington, 2008) is:

$$Rs_t = \alpha + \beta_1 Ro_t + \beta_2 Rwm_t + \varepsilon_t \qquad (1)$$

where α is the constant term, $\boldsymbol{Rs_t}$ is excess returns of each country stock indices. $\boldsymbol{Ro_t}$ is the return on oil prices, the oil prices used throughout the study are based on West Texas Intermediate (WTI). $\boldsymbol{Rwm_t}$ is excess world stock returns and $\boldsymbol{\varepsilon_t}$ is the error term.

However, two-factor models above may be underspecified because the exchange rate between the home currency and the US $ are not included (Sadorsky, 2001). Because oil is priced in U.S. dollars in international markets (Ramos et al., 2011), an exchange rate factor as a proxy for foreign exchange risk is added, where $\boldsymbol{ER_t}$ is the return on the exchange rate between the local currency and the US dollars. Furthermore, other control macroeconomic variables included are, $\boldsymbol{IP_i}$ which measures industrial production, $\boldsymbol{Inf_i}$ which represents the inflation rate, and $\boldsymbol{IR_t}$ which is difference between the interest rate of country i and the U.S. Consequently Model 2 for each country is established as follows:

$$Rs_t = \alpha + \beta_1 Ro_t + \beta_2 Rwm_t + \beta_3 ER_t + \beta_4 IP_t + \beta_5 IR_t + \beta_6 Inf_t + \varepsilon_t \qquad (2)$$

The following hypothesis will be tested:

$$H_o: \ \beta_1 = 0$$

If oil price have effect on stock markets, H_o will be rejected

4.2. Data Description

It is worth mentioning that unlike stock returns series, some macroeconomic factors are not available at daily frequency. Thus, the analysis is conducted at a uniform monthly frequency which totals 195 observations each variable.

i. Excess Returns of Stock Indices (Rs_t)

As CAPM specified, only the return in excess of the risk-free rate is of concern. So, excess stock returns are used in this study. The excess returns of each country's stock indices is calculated as $Rs_t = \ln\frac{Rindex_{it}}{Rindex_{it-1}} - R_{fr}$. The return on stock indices ($\ln\frac{Rindex_{it}}{Rindex_{it-1}}$) is derived by stating the option *PCH#* on Datastream. Where, $Rindex_{it}$ and $Rindex_{it-1}$ is total index of country i stock indices at time *t* and *t-1* respectively, while, R_{fr} denotes risk free rate specified by the yield on 3-month U.S. Treasury Bills.

ii. Oil Return (Ro_t)

Data of historical oil price follows the monthly crude oil price of West Texas Intermediate (WTI). The oil return is calculated as $Ro_t = \ln\frac{oil_{it}}{oil_{it-1}}$ or obtained by stating the option *PCH#* on Datastream. While, oil_{it} and oil_{it-1} is respective price of oil at time *t* and *t-1*.

iii. World Excess Returns (Rwm_t)

The excess world stock returns is measured as $Rwm_t = \ln\frac{MSCI_t}{MSCI_{t-1}} - R_{fr}$ where, $MSCI_t$ and $MSCI_{t-1}$ is MSCI World Stock Index at time t and t-1, and R_{fr} denotes risk free rate defined by the yield on 3-month U.S. Treasury Bills. The MSCI world stock return ($\ln\frac{MSCI_t}{MSCI_{t-1}}$) is acquired by stating the option *PCH#* on Datastream.

iv. Exchange Rate (ER_t)

As mentioned above, because oil is priced in U.S. dollars in international markets, an exchange rate factor as a proxy for foreign exchange risk is added (McSweeney and Worthington, 2008). Moreover, exchange rate is typically employed as a source of systematic asset price risk. The exchange rate factor is defined as $ER_t = \ln\frac{xxx/usdi_t}{xxx/usd_{t-1}}$ where ER_t is the monthly change in the exchange rate between the country i currency and the US$ at time *t* and obtained by specifying the option *PCH#* on Datastream. While, xxx/usd_t and xxx/usd_{t-1} is the exchange rate between the home currency and the US $ at time *t* and *t-1* respectively.

v. Industrial Production (IP_t)

Industrial production is an economic indicator that measures real output of industrial sector of a country's economy. It includes manufacturing, mining, and electric, and gas utilities. IP_t variable is specified as monthly industrial production growth rate and acquired from Datastream database.

vi. Inflation Rate (Inf_t)

Inflation is an increase of general price of goods and services. All data of inflation series extracted from Datastream database.

vii. Interest Rate (IR_t)

As the study is in international setting, interest rates cannot be employed directly, because they are expressed in local currencies (Ramos et al, 2011). Thus, interest rate differential in relation to the common currency, the U.S. dollar, is employed. IR_t is constructed as $IR_t = irhome_{it} - irUS_t$ where $irhome_{it}$ is interest rate of home country i at time t and $irUS_t$ is interest rate of USA at time *t*.

4.3. Research Methodology

i. Time series unit root tests

Formally, a time series is said to be stationary if its mean and variance is constant over time, and if the covariance between two values from the series depends only on the length of time separating the two values, and not on the actual times at which the variables are observed. Econometrics theory suggest that time series variables should be stationary in order to avoid spurious regression. Augmented Dickey Fuller (ADF) is employed to test for presence of unit root. The null hypothesis is the series contains unit root and thus not stationary. While, if the null hypothesis is rejected, a stationary characteristic can be concluded.

ii. Bound tests of time series analysis

To investigate whether there is a cointegration or long-term relationship among variables of interest, bounds testing (or autoregressive distributed lag (ARDL)) cointegration procedure, developed by Pesaran et al. (2001), is used. Unlike other cointegration test, bound test is applicable regardless of whether the variables in the model are *I(0)* or *I(1)* or a mixture of those. However, the method is invalid in the presence of *I(2)* series.

Derived from equation 3, bound test evaluates the null hypothesis $H_0 : \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = 0$ which indicates the non-existence of a long-run relationship. While, the alternative hypothesis is $H_1 : \beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq \beta_{13} \neq 0$ indicating there is a long-run relationship. The null hypothesis of no cointegration is rejected when the calculated F-statistics is greater than critical value of the upper bound or when the calculated t-statistics is lower than critical value of the upper bound. If the calculated value falls within the bound, then the inference is inconclusive.

<TABLE 3>

iii. ARDL approach

Autoreggresive Distributed Lag (ARDL) model was proposed by Pesaran and Shin (1999) and was further extended by Pesaran et al (2001). This method is employed in order to capture the long-run as well as the short-run dynamic relationship among the variables. The ARDL model of the relationship between excess returns of stock indices (Rs_t) and oil returns (Ro_t), world excess returns (Rwm_t), exchange rate (ER_t), industrial production (IP_t), inflation rate (Inf_t) and interest rate (IR_t) for every country can be estimated as follows:

$$\begin{aligned}\Delta Rs_t = \alpha + \sum_{i=1}^{p} \beta_0 \Delta Rs_{t-i} + \sum_{i=1}^{q} \beta_1 \Delta Ro_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta Rwm_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta ER_{t-i} \\ + \sum_{i=1}^{q} \beta_4 \Delta IP_{t-i} + \sum_{i=1}^{q} \beta_5 \Delta IR_{t-i} + \sum_{i=1}^{q} \beta_6 \Delta Inf_{t-i} + \beta_7 Rs_{t-i} + \beta_8 Ro_{t-i} \\ + \beta_9 Rwm_{t-i} + \beta_{10} ER_{t-i} + \beta_{11} IP_{t-i} + \beta_{12} IR_{t-i} + \beta_{13} Inf_{t-i} + \varepsilon_t \qquad (3)\end{aligned}$$

The first part of the model with $\beta_0$to β_6 represents the short-run dynamics of the models; whereas the second part with β_6 to β_{13} represents the long-run relationship and ε_t is the error term.

Once cointegration is established, optimal lag length is selected based on Akaike Information Criterion (AIC), then, long run and short run coefficients can be estimated. The conditional ARDL $(p_1, q_1, q_2, q_3, q_4, q_5, q_6)$ long-run model is established as follows:

$$Rs_t = \alpha + \sum_{i=1}^{p} \beta_0 Rs_{t-i} + \sum_{i=0}^{q_1} \beta_1 Ro_{t-i} + \sum_{i=0}^{q_2} \beta_2 Rwm_{t-i} + \sum_{i=0}^{q_3} \beta_3 ER_{t-i} + \sum_{i=0}^{q_4} \beta_4 IP_{t-i} + \sum_{i=0}^{q_5} \beta_5 IR_{t-i} + \sum_{i=0}^{q_6} \beta_6 Inf_{t-i} + \varepsilon_t \quad (4)$$

Finally, Short Run Dynamic coefficients are obtained by estimating an error correction model associated with long run estimates. The equation is as follows:

$$\Delta Rs_t = \alpha + \sum_{i=1}^{p} \beta_0 \Delta Rs_{t-i} + \sum_{i=0}^{q_1} \beta_1 \Delta Ro_{t-i} + \sum_{i=0}^{q_2} \beta_2 \Delta Rwm_{t-i} + \sum_{i=0}^{q_3} \beta_3 \Delta ER_{t-i} + \sum_{i=0}^{q_4} \beta_4 \Delta IP_{t-i} + \sum_{i=0}^{q_5} \beta_5 \Delta IR_{t-i} + \sum_{i=0}^{q_6} \beta_6 \Delta Inf_{t-i} + \beta_7 ECT_{t-1} + \varepsilon_t \quad (5)$$

Where β_0 to β_6, are the short-run dynamic coefficients of the model's convergence to equilibrium, while β_7 represents the speed of adjustment.

5. Empirical Findings and Discussions

5.1. Summary Statistics

Table 4 displays summary of descriptive statistics of excess returns of each country's stock indices. The sample means, standard deviations, skewness and kurtosis are presented. It can be seen that all of the series except Russia, Turkey and Venezuela display negative skewness characteristics suggesting most of the excess returns series have more possibilities of declines rather than increases. Similar observation can be said about the mean, all but three aforementioned countries showing negative mean excess returns of the stock indices. Furthermore, Russia, Turkey

and Venezuela stock indices exhibit most volatile excess returns compared to other countries in the study.

TABLE 4 – Descriptive Statistics of Stock Indices Excess Returns (Rs_t)

	Mean	Std. Dev.	Skewness	Kurtosis	Observations
Australia	-1.3715 %	4.2725	-0.2081	2.8700	195
Austria	-1.1653 %	6.5171	-0.5094	4.6077	195
Belgium	-1.5225 %	5.5960	-0.7059	4.4483	195
Brazil	-0.8351 %	7.6127	-0.1133	2.9471	195
Canada	-1.3287 %	4.8801	-0.6085	4.6843	195
China	-1.0152 %	8.5107	-0.2156	3.7988	195
France	-1.6605 %	5.7857	-0.2508	2.9530	195
Germany	-1.2470 %	6.7008	-0.3004	3.5631	195
India	-0.4627 %	8.5936	-0.0937	5.0201	195
Indonesia	-0.4197 %	6.9100	-0.3772	3.8899	195
Japan	-1.6716 %	5.8636	-0.1351	3.0578	195
Malaysia	-1.1926 %	4.7393	-0.5323	3.9042	195
Mexico	-0.5243 %	6.1524	-0.3218	3.7020	195
Netherlands	-1.6619 %	5.9931	-0.6224	3.6948	195
Nigeria	-0.6510 %	7.1830	0.7274	10.5485	193
Norway	-0.8276 %	6.3931	-0.6571	3.8998	195
Russia	2.1823 %	40.5386	11.7723	156.5067	195
South Africa	-0.5969 %	5.3341	-0.1512	3.2446	195
South Korea	-1.1521 %	7.0632	-0.2560	3.7000	195
Saudi Arabia	-0.8250 %	7.6326	-0.5783	4.1597	195
Singapore	-1.4539 %	6.1193	-0.2058	5.0596	195
Switzerland	-1.5841 %	4.6825	-0.3416	3.3942	195
Turkey	0.1288 %	12.8824	1.8225	16.0429	195
UK	-1.6568 %	4.7397	-0.2788	3.2871	195
USA	-1.4147 %	5.2940	-0.1938	3.4219	195
Venezuela	3.1885 %	13.4452	2.7501	16.8449	195
Oil Return	0.6350 %	9.6208	-0.2383	3.5814	195
MSCI world	-1.4990 %	5.3393	-0.2051	3.5439	195

To test for stationarity features of all variables, Augmented Dickey-Fuller (ADF) test is used and optimum lag of 1 is chosen. Moreover, the test is conducted in both level as well as first difference and includes intercept and with and without trend. Often, non-stationary series can be made stationary by taking their first differences. A series is integrated of order *d* (denoted *I(d)*) if it attains stationarity after differencing *d* times. If the series is stationary after taking first difference

or *I(1)*, it is considered to have a unit root (Uwubanmwen & Eghosa, 2015*)*. Table, 5, 6 and 7 present the results of ADF unit root test. It can be seen that oil returns (Ro_t), world excess returns (Rwm_t), all countries' stock indices excess returns (Rs_t) and exchange rate (ER_t) display stationary behavior, that is series without unit roots. Meanwhile, industrial production (IP_t), inflation rate (Inf_t) and interest rate (IR_t) series display differing characteristics among all countries, some countries' series are stationary at levels. While, those non-stationary series at levels are made stationary by taking their first difference. Furthermore, no series in the study display *I(2)* characteristics.

TABLE 5 – result of ADF test on oil and world excess returns

	With Intercept	With Intercept and Trend
Ro_t	**-9.075**	**-9.194**
ΔRo_t	**-15.802**	**-15.759**
Rwm_t	**-8.063**	**-8.952**
ΔRwm_t	**-18.449**	**-18.404**
5% Critical Values	-2.884	-4.01

TABLE 6 – result of ADF test on countries' variables (with intercept)

	Level					First Difference				
	Rs_t	ER_t	IP_t	IR_t	Inf	ΔRs_t	ΔER_t	ΔIP_t	ΔIR_t	ΔInf
Australia	**-8.166**	**-9.618**	**-3.667**	-2.243	-2.83	**-17.949**	**-18.304**	**-9.723**	**-6.757**	**-9.725**
Austria	**-7.494**	**-9.9**	**-4.473**	-2.192	-2.347	**-15.476**	**-18.084**	**-20.359**	**-6.364**	**-8.738**
Belgium	**-8.338**	**-9.9**	**-3.572**	-2.192	-2.612	**-16.606**	**-18.084**	**-13.122**	**-6.364**	**-7.674**
Brazil	**-8.843**	**-7.841**	-2.812	-2.679	**-3.369**	**-16.15**	**-15.699**	**-8.883**	**-5.275**	**-6.452**
Canada	**-7.336**	**-9.455**	-2.73	-2.137	**-4.11**	**-15.73**	**-16.28**	**-9.568**	**-10.759**	**-10.816**
China	**-8.341**	**-6.903**	**-14.734**	-2.021	-2.208	**-15.52**	**-15.117**	**-19.779**	**-6.197**	**-8.176**
France	**-8.37**	**-9.9**	**-4.394**	-2.252	-2.291	**-17.013**	**-18.084**	**-21.964**	**-5.424**	**-9.119**
Germany	**-8.738**	**-9.9**	**-3.638**	-2.252	-2.182	**-17.295**	**-18.084**	**-20.848**	**-5.424**	**-9.529**
India	**-8.596**	**-9.941**	**-15.432**	-1.402	-0.997	**-16.511**	**-17.895**	**-26.844**	**-11.007**	**-4.987**
Indonesia	**-8.063**	**-10.757**	**-7.392**	**-4.127**	**-3.396**	**-17.478**	**-16.881**	**-17.04**	**-17.06**	**-9.193**
Japan	**-7.013**	**-9.054**	**-3.262**	-2.039	-2.673	**-16.307**	**-16.567**	**-8.525**	**-7.104**	**-8.678**
Malaysia	**-7.291**	**-9.512**	**-3.708**	-1.906	**-4.172**	**-15.93**	**-17.768**	**-12.175**	**-8.448**	**-8.311**
Mexico	**-8.728**	**-9.145**	**-3.594**	**-3.195**	**-3.599**	**-17.069**	**-16.391**	**-15.919**	**-10.281**	**-9.991**
Netherlands	**-7.783**	**-9.9**	**-5.01**	-2.192	-1.996	**-16.608**	**-18.084**	**-14.987**	**-6.364**	**-9.762**
Nigeria	**-8.613**	**-10.462**	**-7.14**	-1.798	**-4.02**	**-16.39**	**-17.153**	**-7.906**	**-9.336**	**-9.595**
Norway	**-7.675**	**-8.612**	**-7.234**	-1.236	**-4.668**	**-15.474**	**-16.891**	**-15.872**	**-6.003**	**-9.664**
Russia	**-11.318**	**-8.32**	-2.545	**-3.581**	**-3.647**	**-17.995**	**-12.729**	**-10.054**	**-9.948**	**-5.944**
South Africa	**-8.528**	**-9.581**	**-3.182**	-1.526	-2.233	**-17.856**	**-17.197**	**-12.604**	**-6.073**	**-5.809**

South Korea	**-8.95**	**-11.055**	**-4.453**	-1.952	-2.568	**-19.458**	**-20.512**	**-13.969**	**-7.405**	**-10.677**
Saudi Arabia	**-7.642**	**-12.888**	**-12.916**	**-2.934**	-1.507	**-15.731**	**-19.125**	**-23.225**	**-8.977**	**-7.095**
Singapore	**-7.225**	**-10.795**	**-5.048**	-1.7	-1.767	**-15.025**	**-19.771**	**-14.831**	**-6.934**	**-9.185**
Switzerland	**-7.585**	**-11.292**	-2.945	-2.236	-2.399	**-17.515**	**-20.247**	**-9.667**	**-7.81**	**-8.163**
Turkey	**-10.848**	**-9.231**	**-3.334**	**-4.43**	**-3.06**	**-17.877**	**-16.514**	**-9.923**	**-16.203**	**-6.707**
UK	**-8.076**	**-8.86**	-2.984	-1.504	-1.95	**-17.836**	**-18.433**	**-10.998**	**-6.496**	**-8.183**
USA	**-8.306**	-	-2.144	-1.855	**-3.89**	**-18.833**	**-**	**-6.608**	**-6.862**	**-9.555**
Venezuela	**-7.111**	**-9.804**	-2.59	**-3.203**	**3.892**	**-15.438**	**-18.569**	**-9.725**	**-10.275**	**-3.744**

ADF critical values: 1% level -3.479, 5% level -2.884, 10% level -2.574. Bold numbers are stationary at 5%.

TABLE 7 – result of ADF test on countries' variables (with intercept and trend)

	Level					**First Difference**				
	Rs_t	ER_t	IP_t	IR_t	Inf	ΔRs_t	ΔER_t	ΔIP_t	ΔIR_t	ΔInf
Australia	**-8.85**	**-9.65**	**-3.676**	-1.747	**-3.588**	**-17.904**	**-18.258**	**-9.708**	**-6.887**	**-9.714**
Austria	**-7.548**	**-10.021**	**-4.576**	-2.078	-2.488	**-15.441**	**-18.037**	**-20.309**	**-6.484**	**-8.735**
Belgium	**-8.936**	**-10.021**	**-3.708**	-2.078	-2.667	**-16.573**	**-18.037**	**-13.088**	**-6.484**	**-7.65**
Brazil	**-8.938**	**-7.862**	-3.287	-2.872	**-3.508**	**-16.108**	**-15.658**	**-8.862**	**-5.336**	**-6.401**
Canada	**-7.855**	**-9.583**	-2.709	-1.992	**-4.558**	**-15.69**	**-16.236**	**-9.562**	**-10.786**	**-10.788**
China	**-8.577**	**-6.904**	**-14.761**	-1.416	-2.218	**-15.478**	**-15.076**	**-19.718**	**-6.33**	**-8.168**
France	**-9.225**	**-10.021**	**-4.374**	-2.149	-3.057	**-16.967**	**-18.037**	**-21.932**	**-5.531**	**-9.129**
Germany	**-9.606**	**-10.021**	**-3.62**	-2.149	-2.408	**-17.25**	**-18.037**	**-20.8**	**-5.531**	**-9.129**
India	**-8.862**	**-10.014**	**-15.391**	-2.286	-2.531	**-16.468**	**-17.848**	**-26.766**	**-10.98**	**-4.995**
Indonesia	**-8.341**	**-10.735**	**-7.538**	**-4.488**	**-3.976**	**-17.435**	**-16.837**	**-16.992**	**-17.024**	**-9.252**
Japan	**-7.674**	**-9.046**	-3.245	-1.678	-2.923	**-16.272**	**-16.522**	**-8.504**	**-7.201**	**-8.657**
Malaysia	**-8.053**	**-9.684**	**-3.59**	-1.814	**-4.21**	**-15.891**	**-17.721**	**-12.21**	**-8.494**	**-8.286**
Mexico	**-9.02**	**-9.175**	**-3.581**	**-3.529**	**-3.901**	**-17.024**	**-16.344**	**-15.879**	**-10.281**	**-10.069**
Netherlands	**-8.601**	**-10.021**	**-5.135**	-2.078	-2.604	**-16.563**	**-18.037**	**-14.954**	**-6.484**	**-9.764**
Nigeria	**-8.591**	**-10.436**	**-7.198**	-2.046	**-4.472**	**-16.35**	**-17.108**	**-7.878**	**-9.337**	**-9.604**
Norway	**-7.961**	**-8.788**	**-7.21**	-1.326	**-4.629**	**-15.432**	**-16.847**	**-15.841**	**-6.033**	**-9.647**
Russia	**-11.5**	**-8.527**	-2.897	**-3.586**	**-3.675**	**-17.948**	**-12.688**	**-10.029**	**-9.933**	**-5.922**
South Africa	**-9.174**	**-9.636**	-3.226	-1.522	-2.114	**-17.812**	**-17.151**	**-12.572**	**-6.058**	**-5.911**
South Korea	**-9.277**	**-11.04**	**-4.538**	-1.606	-3.393	**-19.421**	**-20.459**	**-13.951**	**-7.496**	**-10.692**
Saudi Arabia	**-7.634**	**-12.852**	**-12.881**	**-3.961**	-1.526	**-15.692**	**-19.076**	**-23.162**	**-8.936**	**-7.092**
Singapore	**-7.543**	**-10.787**	**-5.072**	-1.519	-1.64	**-14.993**	**-19.72**	**-14.791**	**-6.971**	**-9.198**
Switzerland	**-8.361**	**-11.323**	-2.94	-1.935	-3.136	**-17.487**	**-20.194**	**-9.643**	**-7.843**	**-8.142**
Turkey	**-10.941**	**-9.232**	-3.346	**-5.634**	-2.96	**-17.827**	**-16.471**	**-9.9**	**-16.161**	**-6.836**
UK	**-9.197**	**-8.884**	-2.977	-2.132	-1.754	**-17.793**	**-18.391**	**-10.985**	**-6.518**	**-8.247**
USA	**-9.552**	**-**	-2.154	-1.606	**-4.338**	**-18.788**	**-**	**-6.591**	**-6.919**	**-9.529**
Venezuela	**-7.965**	**-9.781**	-2.792	-3.226	3.006	**-15.396**	**-18.52**	**-9.702**	**-10.249**	**-4.347**

ADF critical values: 1% level -4.01, 5% level-3.438, 10% level -3.138. Bold numbers are stationary at 5%.

5.2. Two-Factor Model Regression

The stationarity feature of the variables in the two-factor model (equation 1) allows the ordinary least squares method to be employed. The estimated coefficient and t-statistics of the regressors along with R-squared are demonstrated in Table 8.

TABLE 8 – Result of OLS Regression (Two-Factor Model)

	Ro_t	Rwm	cons	R^2	
Australia	-0.0119 (-0.59)	0.6564*** (18.23)	-0.38** (-2.01)	0.6584	Net Importer
Austria	0.0764** (2.41)	0.9131*** (16)	0.1550 (0.52)	0.6312	Importer
Belgium	-0.0837*** (-3.31)	0.9059*** (19.88)	-0.1115 (-0.47)	0.6812	Importer
Brazil	0.0500 (1.22)	1.0189*** (13.78)	0.6604* (1.7)	0.5462	Net Exporter
Canada	0.093*** (4.85)	0.720654*** (20.76)	-0.3077* (-1.69)	0.7566	Net Exporter
China	0.1157* (1.79)	0.4045*** (3.48)	-0.4823 (-0.79)	0.1046	Importer
France	-0.0396* (-1.76)	0.9692*** (23.88)	-0.1825 (-0.85)	0.7633	Importer
Germany	-0.0682** (-2.33)	1.0887*** (20.67)	0.4282* (1.55)	0.7030	Importer
India	0.0823* (1.56)	0.9741*** (10.27)	0.9451* (1.89)	0.4136	Importer
Indonesia	0.0642* (1.54)	0.8011*** (10.65)	0.7403* (1.87)	0.4298	Net Exporter
Japan	-0.0101 (-0.3)	0.7683*** (12.62)	-0.5135* (-1.6)	0.4817	Importer
Malaysia	0.0145 (0.46)	0.4791*** (8.4)	-0.4836* (-1.61)	0.3033	Net Exporter
Mexico	0.0244 (0.75)	0.8491*** (14.49)	0.7329** (2.38)	0.5640	Exporter
Netherlands	-0.0086 (-0.34)	0.9578*** (20.95)	-0.2206 (-0.92)	0.7202	Importer
Nigeria	0.1399*** (2.56)	0.2871*** (2.9)	-0.3094 (-0.6)	0.1092	Exporter
Norway	0.1366*** (4.88)	0.8891*** (17.61)	0.4184 (1.58)	0.7000	Exporter

Russia	-0.3003 (-0.94)	1.1763** (2.03)	4.1362 (1.36)	0.0214	Exporter
Saudi Arabia	0.1584*** (2.96)	0.5369*** (5.57)	-0.1208 (-0.24)	0.2332	Exporter
South Africa	0.081** (2.85)	0.6815*** (13.3)	0.3732 (1.38)	0.5562	Importer
South Korea	0.0420 (1.04)	0.8916*** (12.19)	0.1578 (0.41)	0.4845	Importer
Singapore	0.0387 (1.28)	0.8734*** (15.99)	-0.1694 (-0.59)	0.6167	Importer
Switzerland	-0.1008*** (-4.58)	0.7526*** (19)	-0.3919* (-1.88)	0.6556	Importer
Turkey	-0.1511* (-1.69)	1.2669*** (7.86)	2.1238** (2.51)	0.2472	Importer
UK	-0.0180 (-1.15)	0.8198*** (29.15)	-0.4166** (-2.82)	0.8307	Net Importer
USA	-0.0331*** (-3.55)	0.9863*** (58.62)	0.0847 (0.96)	0.9514	Importer
Venezuela	-0.0208 (-0.2)	0.5647** (2.99)	4.0482*** (4.07)	0.0482	Exporter

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

As it can be seen from the table above, the world excess returns' coefficients are highly significant across all countries at one percent level of significance which is consistent with the capital asset pricing model. Furthermore, out of twenty seven countries, the estimated coefficients of oil returns are insignificant in eleven countries. While, it seems rational to assume that oil price have negative effect on oil-importing countries' stock market and conversely positive on oil-exporting counterparts, it could be not as simple as that. Austria, China, India, and South Africa are among oil-importing countries in the sample that have significant positive estimated coefficient indicating existence of positive oil price-stock market relationship. However, the result for China and India could be inconclusive due to low R-squared (0.1 and 0.4) of the model.

5.3. ARDL procedure

After establishing that the variables in model two are mixture of *I(0)* and *I(1)*, with none show the existence of *I(2)* variables, it is possible now to run ARDL (Autoregressive Distributed Lag) analysis to investigate the existence of a long-run as well as short-run dynamics among the

variables in the model. Firstly, ARDL optimal lag structure is selected based on Akaike Information Criterion (AIC). Then, ARDL bound test is conducted to check whether there is a cointegration among the dependent and independent variables. The results of the bound test presented on table 9 show that the calculated F-statistics for all countries are higher than 1% level of significance of the Pesaran et al (2001) upper bound values. Also, their t-statistics are lower than upper bound values at 1% level of significance. Thus, the null hypotheses of no cointegration are rejected, asserting the presence of a long-run cointegration relationship between excess stock returns, oil price returns and other explanatory variables.

<Table 9>

TABLE 10 - Estimated Long Run Coefficients ARDL

	Ro	Rwm	ER	IP	IR	Inf	cons	R-sq
Australia	-0.00570	0.791***	-0.0202	-0.0134	-0.139	0.0633	0.0641	0.812
(1,0,1,3,0,2,0)	(-0.31)	(13.83)	(-0.20)	(-0.19)	(-1.15)	(0.38)	(0.09)	
Austria	0.0955***	1.000***	-0.0411	0.0535	-0.0232	-0.641	1.301*	0.764
(1,0,0,1,0,0,0)	(2.72)	(12.48)	(-0.27)	(0.88)	(-0.08)	(-1.49)	(1.69)	
Belgium	-0.0322	0.982***	-0.279***	0.0283	-0.336**	-0.282*	0.680*	0.820
(3,0,2,2,0,0,0)	(-1.52)	(16.78)	(-2.63)	(0.82)	(-2.04)	(-1.77)	(1.74)	
Brazil	0.0917**	0.489***	0.288***	-0.0862	0.129	-0.270	-0.351	0.813
(1,0,3,0,1,0,0)	(2.11)	(4.14)	(2.86)	(-1.46)	(0.85)	(-1.14)	(-0.16)	
Canada	0.0817***	0.794***	-0.122*	0.00120	0.172	-0.0779	-0.151	0.871
(3,0,1,0,3,0,0)	(5.01)	(15.48)	(-1.75)	(0.03)	(0.95)	(-0.41)	(-0.36)	
China	-0.369**	0.378*	3.542**	-0.232	0.128	-0.695*	0.607	0.644
(1,4,1,1,3,2,3)	(-2.28)	(1.81)	(1.99)	(-0.21)	(0.32)	(-1.86)	(0.63)	
France	-0.0119	1.041***	-0.541***	0.0154	-0.355**	0.0999	-0.206	0.901
(1,1,0,0,0,0,1)	(-0.44)	(22.99)	(-8.67)	(0.44)	(-2.23)	(0.42)	(-0.52)	
Germany	-0.0898***	1.264***	-0.576***	-0.00199	-0.571***	0.777**	-0.512	0.913
(4,1,1,0,4,0,1)	(-3.24)	(19.88)	(-7.57)	(-0.07)	(-3.67)	(2.56)	(-1.03)	
India	-0.192*	0.582	1.541***	-0.737***	1.494**	-0.125	-11.50	0.925
(1,2,4,4,3,2,0)	(-2.01)	(0.92)	(3.03)	(-2.82)	(2.24)	(-0.56)	(-1.65)	
Indonesia	0.0587*	0.695***	0.576***	-0.0873*	0.0501	-0.197*	2.998***	0.747
(2,0,2,0,0,4,4)	(1.94)	(7.11)	(6.40)	(-1.65)	(0.53)	(-1.73)	(2.84)	
Japan	0.000952	0.761***	-0.867***	-0.0173	0.349**	0.159	0.208	0.766
(4,0,4,4,2,3,0)	(0.04)	(7.17)	(-5.40)	(-0.69)	(2.17)	(0.80)	(0.55)	
Malaysia	0.00883	0.591***	0.279*	-0.132***	0.337**	-0.261	0.464	0.614
(2,0,2,0,2,0,0)	(0.33)	(6.38)	(1.82)	(-3.59)	(2.13)	(-1.63)	(0.82)	
Mexico	0.0318	0.855***	-0.0686	-0.0616	0.309	-0.496	1.825*	0.776
(1,3,0,2,0,0,0)	(1.05)	(9.33)	(-0.57)	(-0.69)	(1.51)	(-1.63)	(1.69)	

Netherlands (1,0,1,1,0,2,0)	0.0389** (2.49)	1.109*** (27.69)	-0.698*** (-9.89)	0.00171 (0.07)	-0.417*** (-3.18)	-0.0924 (-0.57)	0.262 (0.63)	0.909
Nigeria (4,0,3,4,2,2,0)	0.159** (2.20)	0.371** (2.31)	0.826** (2.16)	0.0742 (0.77)	0.0494 (0.19)	-0.254 (-1.63)	2.079 (0.80)	0.593
Norway (1,0,4,0,1,1,4)	0.161*** (6.27)	0.978*** (14.36)	-0.302*** (-3.89)	0.0777 (1.56)	-0.287*** (-2.66)	0.0192 (0.08)	1.142** (2.12)	0.862
Russia (1,2,1,1,1,4,0)	0.0663 (0.63)	1.185*** (7.76)	0.427** (2.14)	-0.176 (-1.64)	-0.339* (-1.77)	0.244 (1.49)	1.235 (0.65)	0.828
Saudi Arabia (1,0,1,3,0,0,0)	0.150* (1.93)	0.694*** (4.19)	53.04*** (2.75)	0.129 (1.16)	1.093 (0.82)	0.182 (0.69)	-2.086 (-1.38)	0.644
South Africa (2,0,1,0,0,1,0)	0.0852*** (3.77)	0.514*** (7.74)	-0.133** (-2.18)	-0.0433 (-1.23)	0.155 (0.61)	-0.389*** (-3.67)	2.671 (1.44)	0.883
South Korea (1,3,1,3,0,2,0)	-0.154* (-1.74)	1.101*** (8.40)	-0.0411 (-0.13)	-0.0459 (-0.92)	-0.386 (-1.23)	0.626* (1.81)	-0.243 (-0.25)	0.755
Singapore (3,3,1,4,1,2,3)	-0.00799 (-0.14)	1.031*** (9.39)	-0.211 (-0.50)	0.0347 (1.39)	-0.217 (-1.21)	-0.0633 (-0.54)	0.805 (1.03)	0.827
Switzerland (4,0,1,1,2,0,0)	-0.0768*** (-3.91)	0.965*** (14.17)	-0.613*** (-7.41)	-0.0391 (-1.04)	-0.219 (-1.30)	0.271 (1.28)	-0.138 (-0.58)	0.862
Turkey (1,1,2,1,0,3,2)	-0.279*** (-4.12)	1.048*** (6.74)	0.929*** (5.41)	-0.0350 (-0.67)	0.101*** (4.19)	-0.0606 (-1.57)	1.676* (1.84)	0.795
UK (1,0,1,1,1,0,0)	0.0130 (1.47)	0.902*** (43.85)	-0.552*** (-12.15)	-0.0375 (-1.42)	0.0328 (0.46)	0.0529 (0.80)	-0.637*** (-2.77)	0.951
USA (2,0,0,0,4,1)	-0.0194** (-2.08)	0.917*** (30.95)	- -	0.0243 (1.16)	-0.172*** (-3.31)	0.116 (1.59)	0.0448 (0.28)	0.977
Venezuela (2,0,1,0,1,0,0)	0.148 (0.98)	0.862*** (2.61)	-0.0744 (-0.49)	-0.0422 (-0.37)	-0.0268 (-0.13)	0.0886 (1.50)	1.564 (0.46)	0.456

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Once the existence of long-run cointegration relationship is established, the long run coefficients are estimated and presented in table 10. All the regression equations are based on the ARDL model selected by AIC. The estimated coefficients of the long-run relationship show that oil prices returns have positive and significant long run effect on stock market returns in the following countries: Austria, Brazil, Canada, Indonesia, Netherlands, Nigeria, Norway, Saudi Arabia and South Africa. The largest positive significant long term effect can be found in Norway, Nigeria, and Saudi Arabia where a 1% rise in oil price returns estimated to cause an increase of 0.161%, 0.159% and 0.15% in excess returns of respective stock indices, all things being equal. Out of those aforementioned countries, oil importers include Austria, Netherlands

and South Africa. On the other hand, stock indices in China, Germany, India, South Korea, Switzerland, Turkey and USA, which all are oil importing countries, react rather significantly negative towards an increase in oil price in the long run. Particularly, China and Turkey are among the countries that most affected in case of such event. A 1% increase in oil price returns is expected to contribute to a decrease of 0.37% and 0.28% in excess returns of respective stock indices. Furthermore, the estimated coefficients of the world excess returns (R_{wmt}) in all countries are highly significant at one percent level which is consistent with the capital asset pricing model.

TABLE 11 - Error Correction Representation for the Selected ARDL

	ΔRo	ΔRwm	ΔER	ΔIP	ΔIR	ΔInf	$ect(-1)$
Australia	-0.00650	0.670***	-0.0747	-0.0152	-1.363*	0.0723	-1.141***
	(-0.30)	(13.72)	(-1.07)	(-0.19)	(-1.87)	(0.38)	(-15.88)
Austria	0.0889***	0.931***	-0.226**	0.0499	-0.0216	-0.597	-0.932***
	(2.67)	(14.63)	(-2.10)	(0.88)	(-0.08)	(-1.47)	(-19.51)
Belgium	-0.0393	0.913***	-0.285***	0.0346	-0.410**	-0.344*	-1.219***
	(-1.56)	(18.32)	(-3.42)	(0.81)	(-2.03)	(-1.73)	(-11.50)
Brazil	0.0963**	0.714***	0.303***	0.194	0.136	-0.283	-1.049***
	(2.07)	(8.10)	(2.91)	(1.40)	(0.85)	(-1.13)	(-12.61)
Canada	0.0991***	0.741***	-0.148*	0.0179	0.209	-0.0945	-1.213***
	(5.07)	(16.93)	(-1.76)	(0.18)	(0.94)	(-0.41)	(-15.92)
China	-0.00561	0.551***	-0.912	0.256	-7.303**	-0.258	-0.982***
	(-0.08)	(3.63)	(-0.68)	(0.89)	(-2.39)	(-0.19)	(-11.67)
France	0.0179	1.109***	-0.576***	0.0164	-0.378**	-0.944	-1.065***
	(0.78)	(27.40)	(-8.46)	(0.44)	(-2.25)	(-1.25)	(-31.70)
Germany	-0.0373	1.350***	-0.692***	-0.0688	-0.686***	-1.096	-1.201***
	(-1.47)	(28.59)	(-8.82)	(-1.62)	(-3.69)	(-1.37)	(-16.02)
India	-0.0298	0.578**	0.763***	0.00349	0.217	-0.155	-1.240***
	(-0.39)	(2.66)	(2.91)	(0.03)	(0.22)	(-0.56)	(-6.10)
Indonesia	0.0710*	0.471***	0.697***	-0.106*	-0.0698	-0.174	-1.209***
	(1.94)	(6.33)	(6.33)	(-1.67)	(-0.54)	(-0.54)	(-12.80)
Japan	0.00124	0.654***	-0.660***	0.0127	-1.970	0.206	-1.297***
	(0.04)	(10.39)	(-6.76)	(0.18)	(-1.39)	(0.80)	(-8.86)
Malaysia	0.00993	0.309***	0.313*	-0.0427	0.378**	-0.293	-1.124***
	(0.33)	(4.68)	(1.81)	(-0.57)	(2.07)	(-1.60)	(-12.14)
Mexico	0.0364	0.845***	-0.0785	-0.198	0.353	-0.567*	-1.143***
	(1.05)	(10.90)	(-0.57)	(-1.42)	(1.54)	(-1.66)	(-10.30)
Netherlands	0.0504**	1.064***	-0.661***	0.00221	0.697	-0.120	-1.297***
	(2.50)	(25.55)	(-9.33)	(0.07)	(0.79)	(-0.57)	(-17.95)

Nigeria	0.173**	0.190	0.469	0.0808	-1.390	-0.277	-1.089***
	(2.22)	(1.34)	(1.46)	(0.77)	(-1.62)	(-1.61)	(-12.31)
Norway	0.185***	0.968***	-0.346***	-0.00631	1.188	-0.672	-1.147***
	(6.38)	(18.04)	(-4.09)	(-0.14)	(1.57)	(-1.48)	(-16.97)
Russia	0.128*	0.927***	0.983***	0.127	-0.511	0.263	-1.075***
	(1.94)	(7.65)	(5.75)	(0.61)	(-1.30)	(1.49)	(-13.68)
Saudi Arabia	0.162*	0.558***	4.274	0.140	1.182	0.196	-1.081***
	(1.93)	(3.93)	(0.63)	(1.16)	(0.82)	(0.69)	(-11.45)
South Africa	0.123***	0.605***	-0.192**	-0.0626	1.731**	-0.564***	-1.447***
	(3.88)	(7.90)	(-2.28)	(-1.23)	(2.26)	(-3.60)	(-11.53)
South Korea	0.0668	0.842***	-0.0753	-0.0465	-3.395*	0.635*	-1.013***
	(1.59)	(8.55)	(-0.52)	(-0.92)	(-1.93)	(1.82)	(-14.11)
Singapore	0.0195	0.740***	0.286	-0.00300	-0.585	0.800*	-1.054***
	(0.65)	(11.17)	(1.54)	(-0.12)	(-0.48)	(1.80)	(-11.38)
Switzerland	-0.0793***	0.829***	-0.483***	0.0348	-0.226	0.280	-1.033***
	(-4.04)	(21.84)	(-8.84)	(0.42)	(-1.32)	(1.31)	(-12.26)
Turkey	-0.179***	0.779***	0.957***	-0.0456	-0.000815	0.917**	-1.305***
	(-2.70)	(5.41)	(5.82)	(-0.67)	(-0.04)	(2.33)	(-19.71)
UK	0.0172	0.899***	-0.528***	0.110	0.0436	0.0704	-1.330***
	(1.48)	(41.73)	(-12.09)	(1.45)	(0.46)	(0.80)	(-19.35)
USA	-0.0207**	0.976***		0.0259	0.268	-0.221	-1.064***
	(-2.09)	(52.04)		(1.16)	(0.71)	(-1.17)	(-42.66)
Venezuela	0.109	0.203	-0.0548	0.226	-0.0198	0.0653	-0.737***
	(1.01)	(1.03)	(-0.49)	(1.25)	(-0.13)	(1.46)	(-7.79)

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table 11 demonstrated the estimated error correction models (ECM) which represent the short-run dynamic coefficients associated with the long-run relationships among stock returns and the explanatory macroeconomic variables. The results show that all error correction term ect(-1), which represents the speed of adjustment from short run deviation to its long-run equilibrium after a shock are all negative and statistically significant at 1% level confirming the existence of stable long-run relationship. For instance, in case of Austria, the error correction term of -0.932 implies that 93.2% of disequilibrium from the previous month's shock converges back to the long-run equilibrium in the current month.

6. Conclusion

The purpose of this study is to explore if changes in oil prices influence stock returns in 26 countries, comprising of oil exporter and importer as well as developed and developing countries, and compare the relationship across those countries from January 2000 to March 2016 using ARDL method. Firstly, Augmented Dickey-Fuller (ADF) test is employed to test for stationarity features of all variables and we found that that oil returns (Ro_t), world excess returns (Rwm_t), all countries' stock indices excess returns (Rs_t) and exchange rate (ER_t) are stationary at level. Whereas, all countries' industrial production (IP_t), inflation rate (Inf_t) and interest rate (IR_t) series exhibit stationary characteristics at first difference.

Due to stationarity feature of the variables in the two-factor models (Rs_t , Ro_t & Rwm_t), the ordinary least squares method can be employed and result shows that the Ro_t coefficients are significant in 15 countries and notable outcome can be said about Austria and South Africa, who have significant positive coefficient indicating the existence of positive oil price-stock market relationship despite being oil importing countries.

Moreover, bound test results show the existence of a long-run cointegration relationship between excess stock returns, oil price returns and other explanatory variables in all countries which allow us to carry on the ARDL model. The long-run estimated coefficients show that oil prices returns have positive and significant long run effect on stock market returns in the following countries: Austria, Brazil, Canada, Indonesia, Netherlands, Nigeria, Norway, Saudi Arabia and South Africa where the largest impact can be found in Norway, Nigeria, and Saudi Arabia in descending order. Out of those aforementioned countries, oil importers include Austria, Netherlands and South Africa.

On the other hand, stock indices in these oil importing countries: China, Germany, India, South Korea, Switzerland, Turkey and USA react significantly and negatively towards an increase in oil price in the long run. Particularly, in descending order, China and Turkey are the most affected of such event. Furthermore, significant estimated coefficients in error correction models (ECM) which represents the short-run dynamics continue to have same signs with its long term counterparts.

All in all, null hypothesis (H_o: $\beta_1 = 0$) of this study as stated in equation 2 is rejected, evidenced by estimated coefficient of oil returns (Ro_t) is not equal to zero in all countries in study. Study found significant negative long-term relationships between oil returns and excess stock returns only happen to net and oil importing countries in the sample. Furthermore, significant positive long-term relationships take place mostly in net and oil exporting countries with the exception of Austria, Netherlands and South Africa. However, the level of development of country found to be unrelated towards the extent of the relationship, at least for these sample countries.

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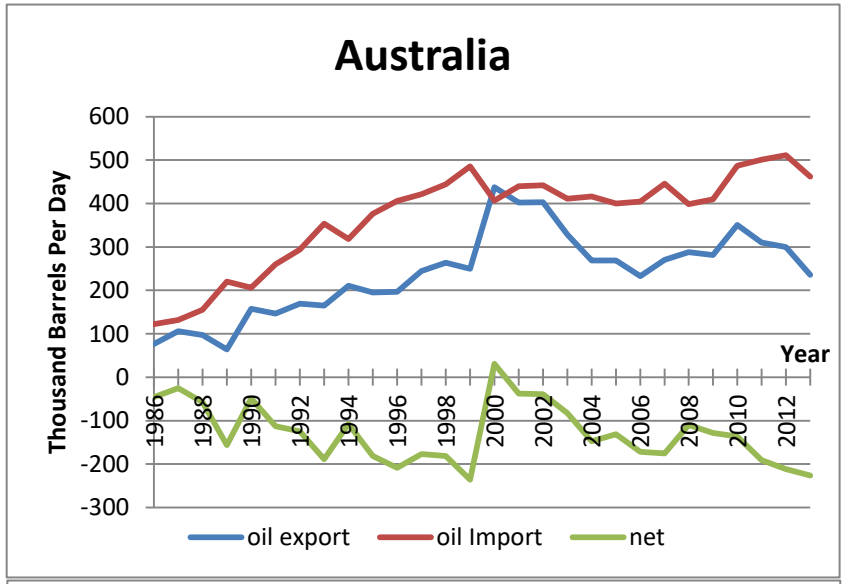
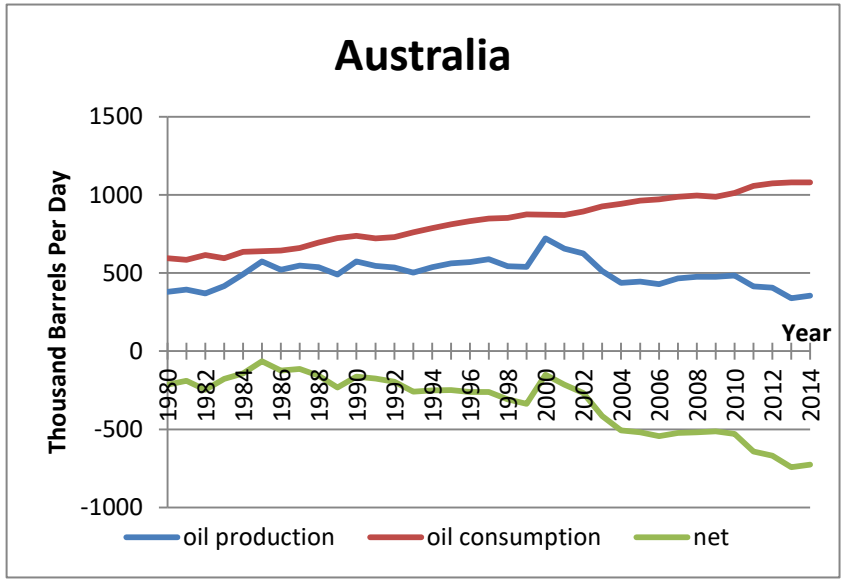
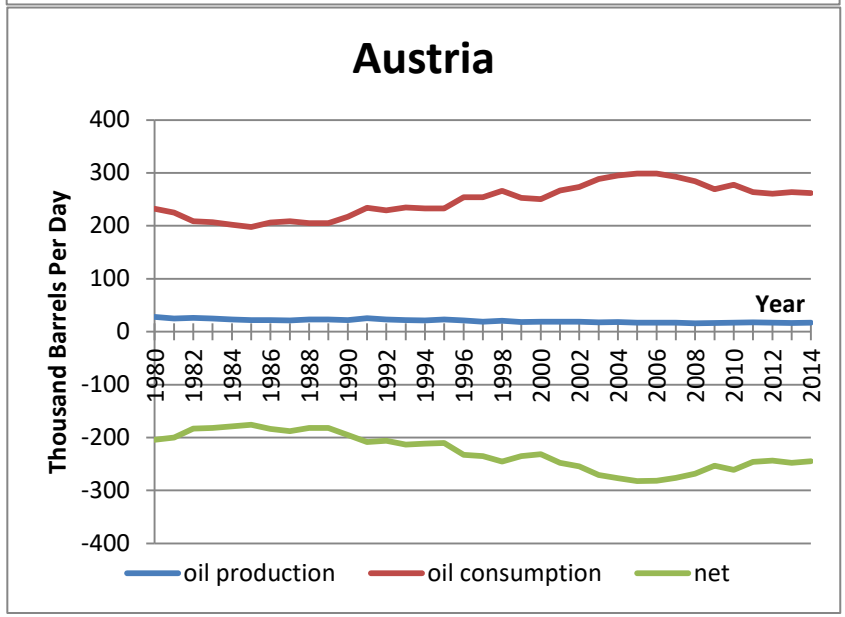
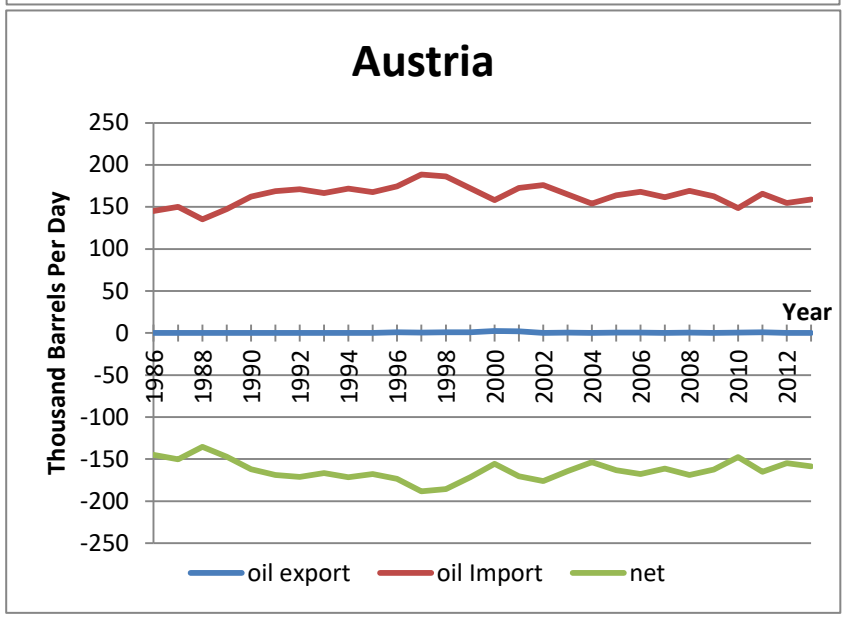
Appendix

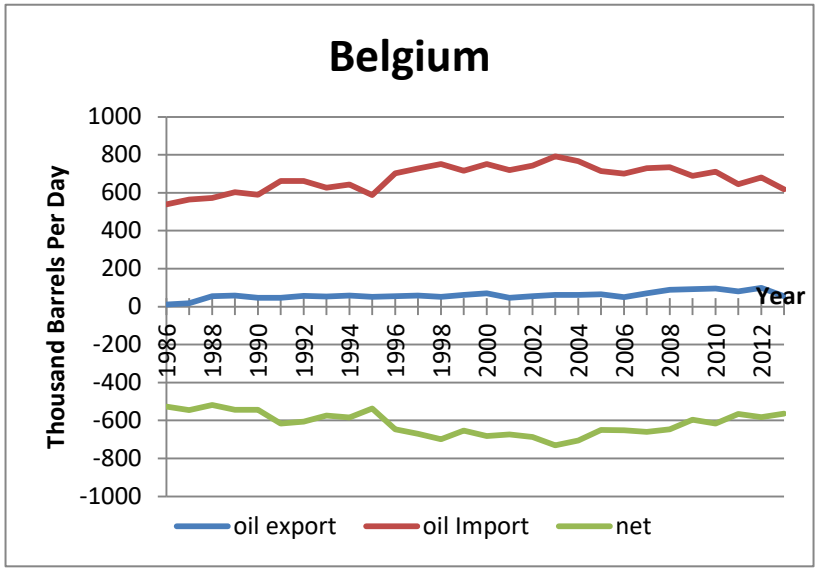
Figures of each country's oil export, import, production and consumption quantity







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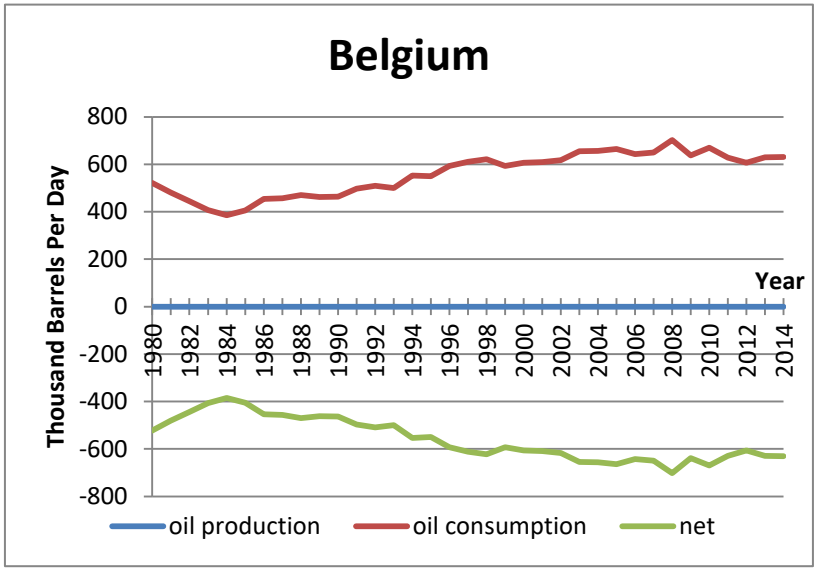
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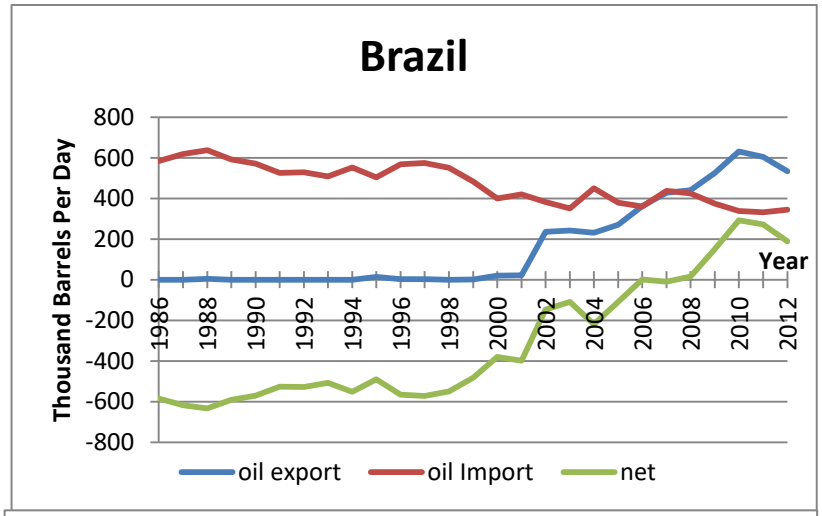
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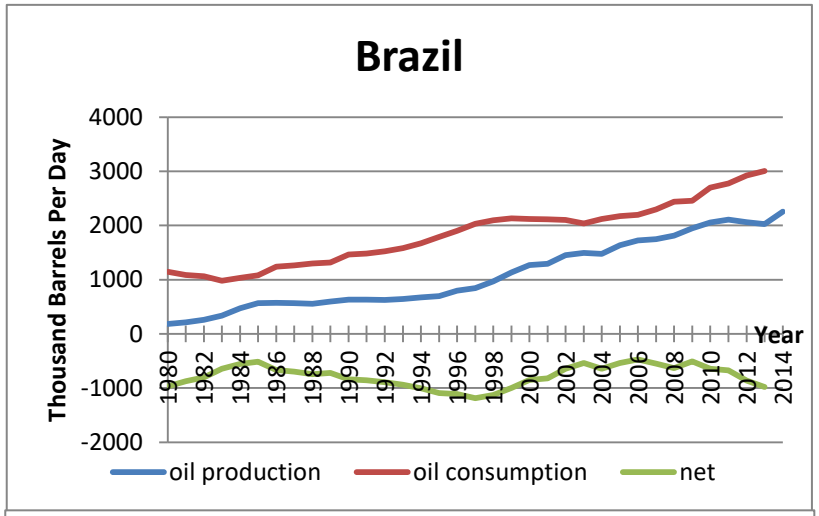
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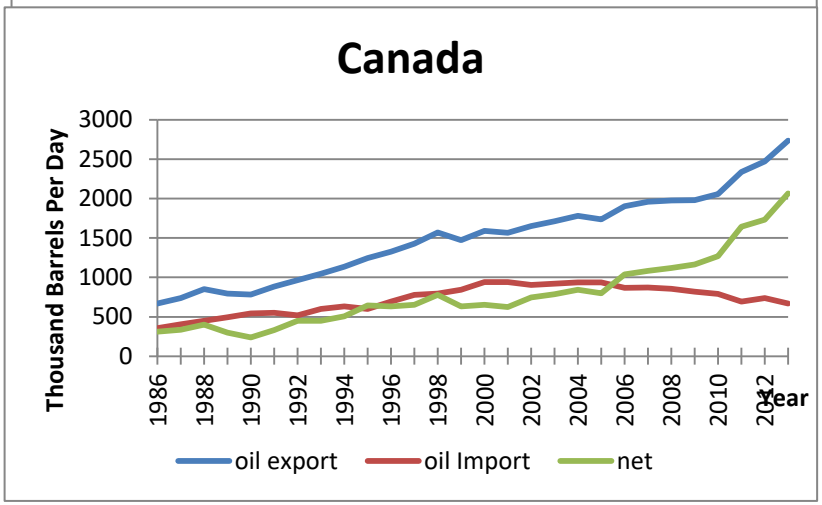
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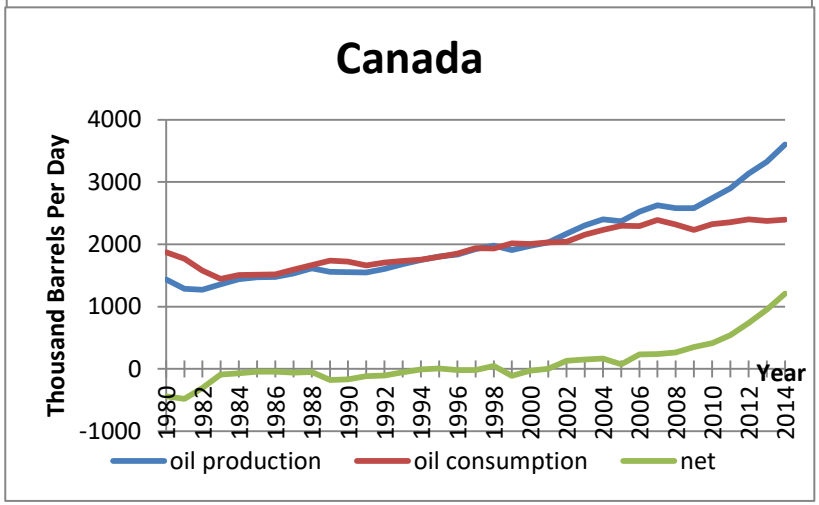
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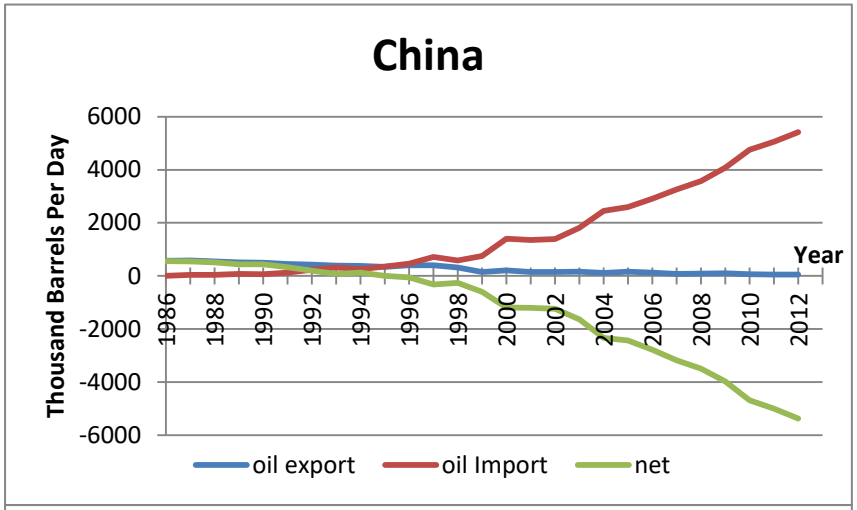
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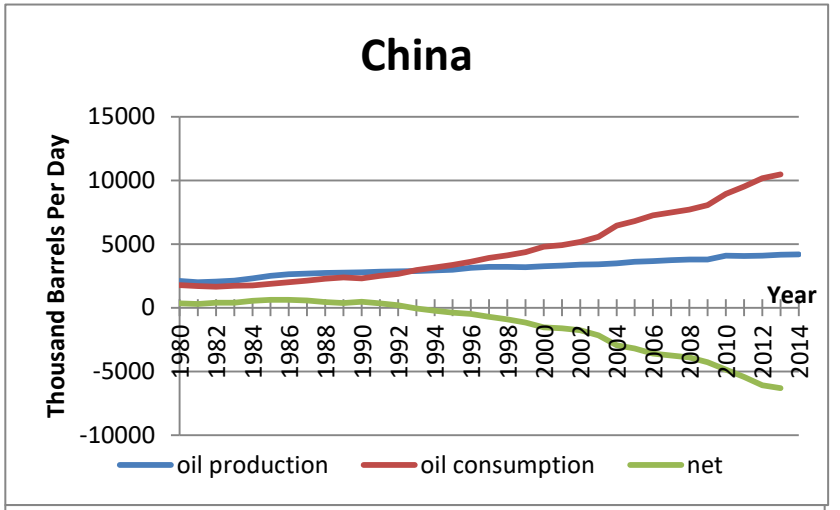
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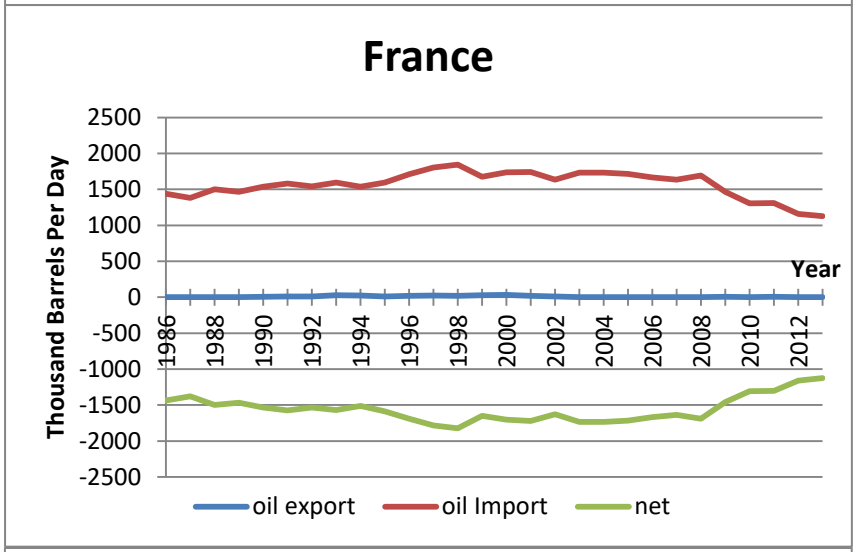
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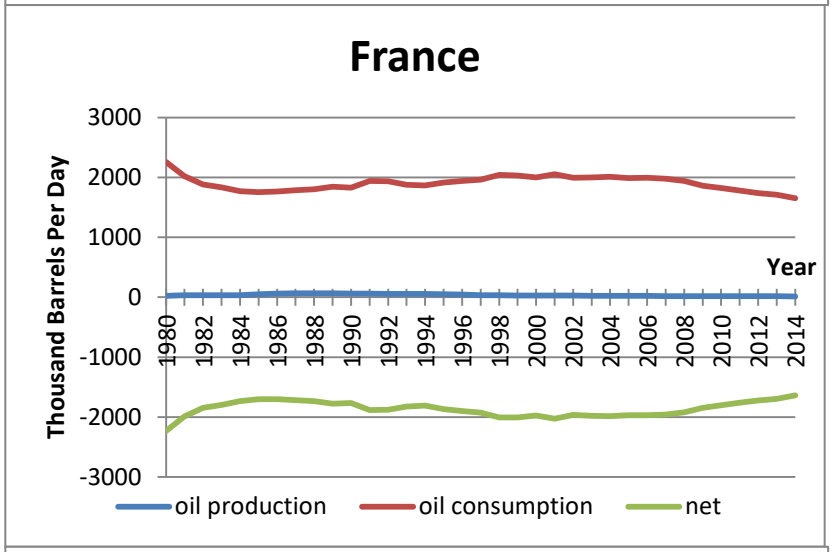
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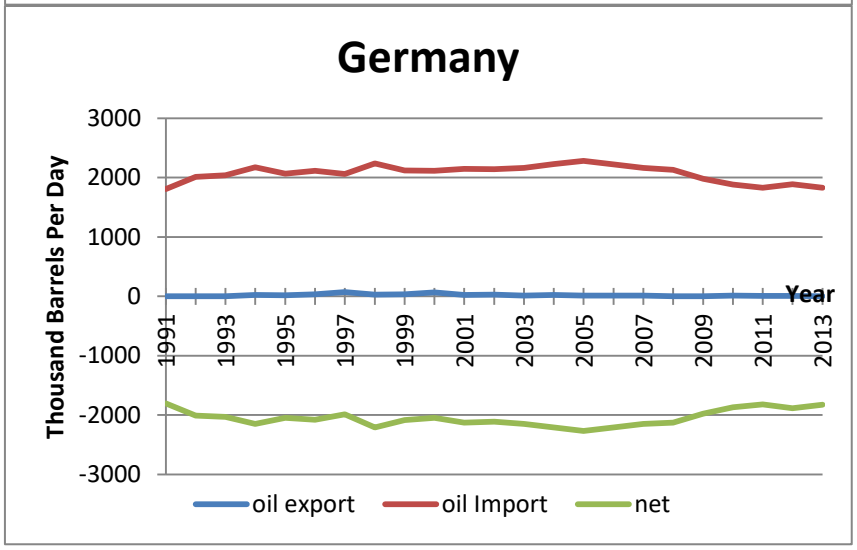
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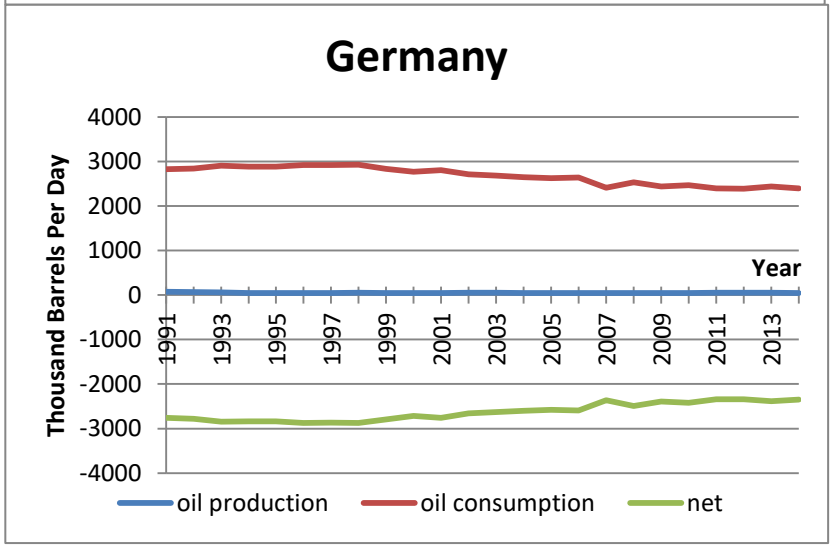
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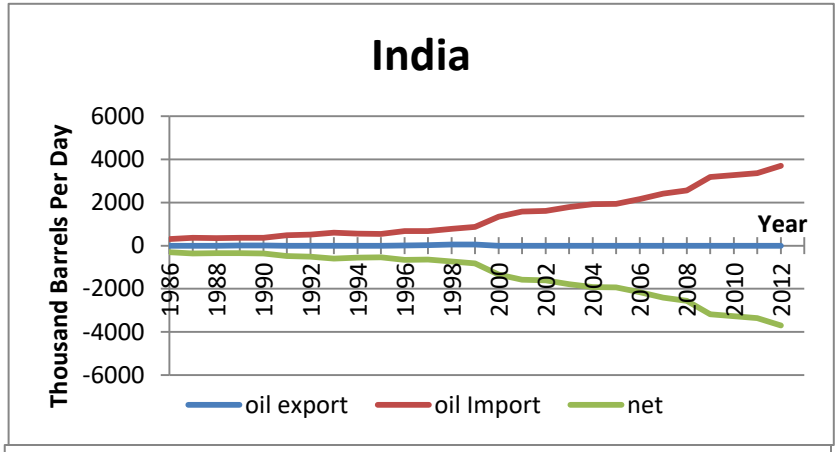
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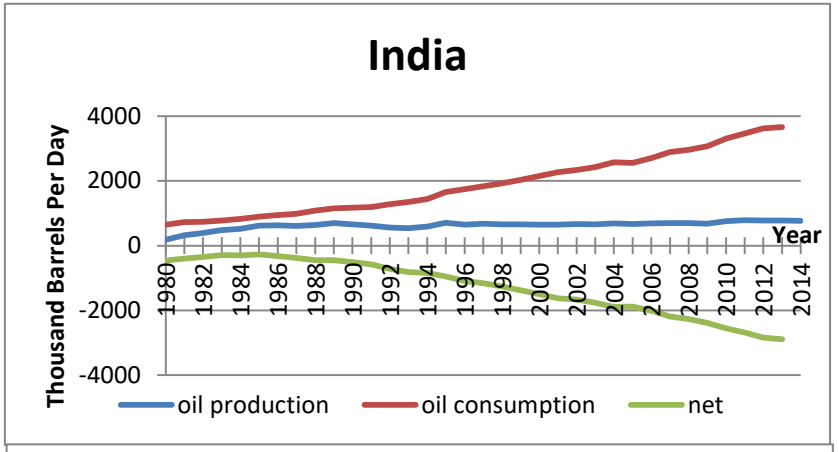
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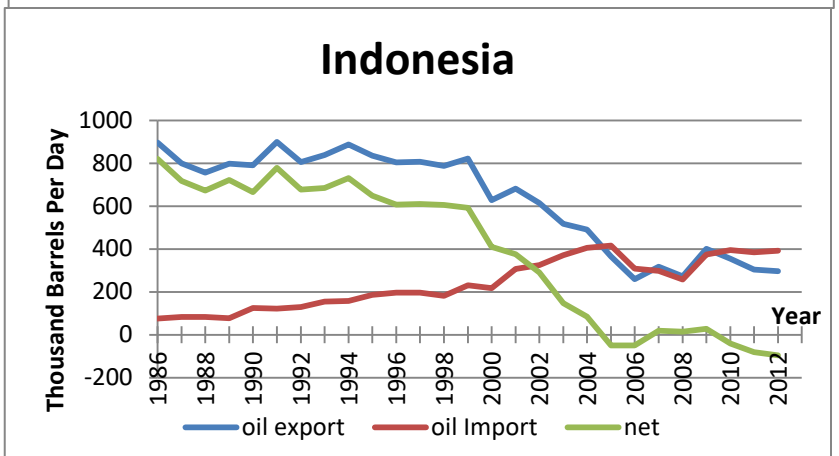
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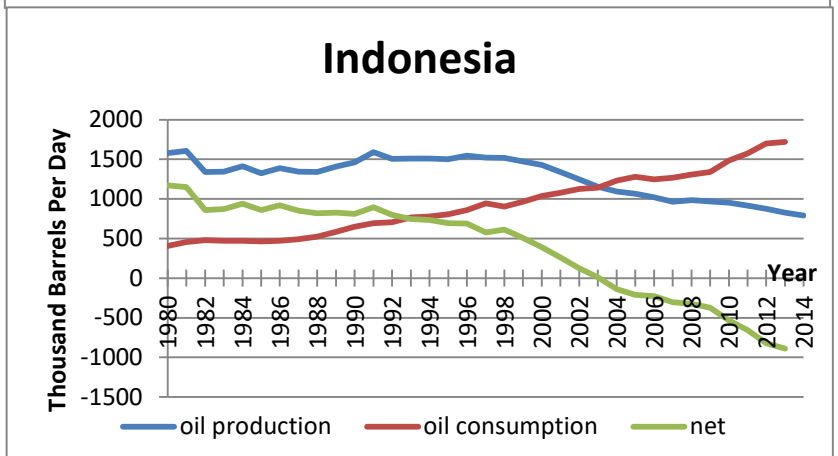
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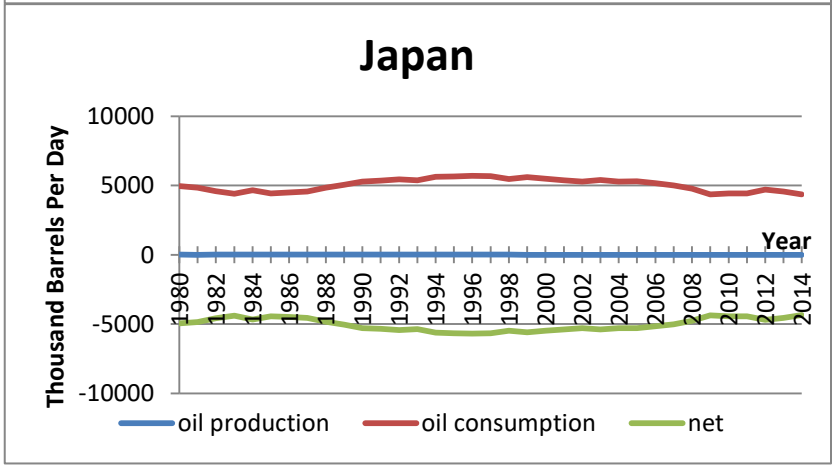
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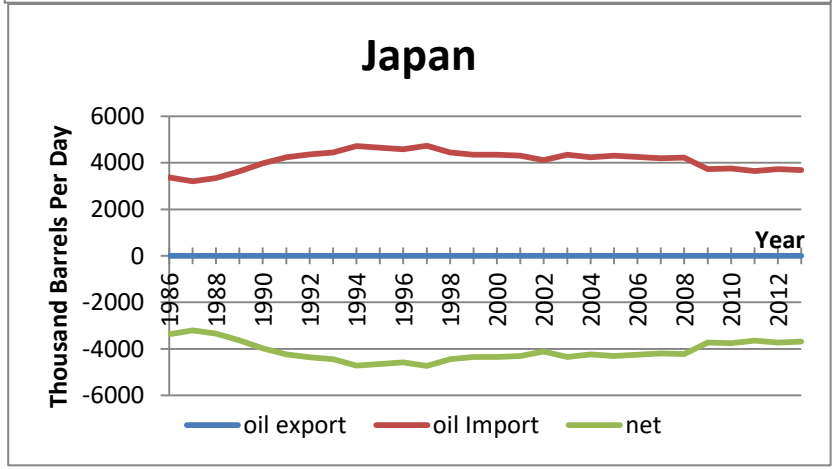
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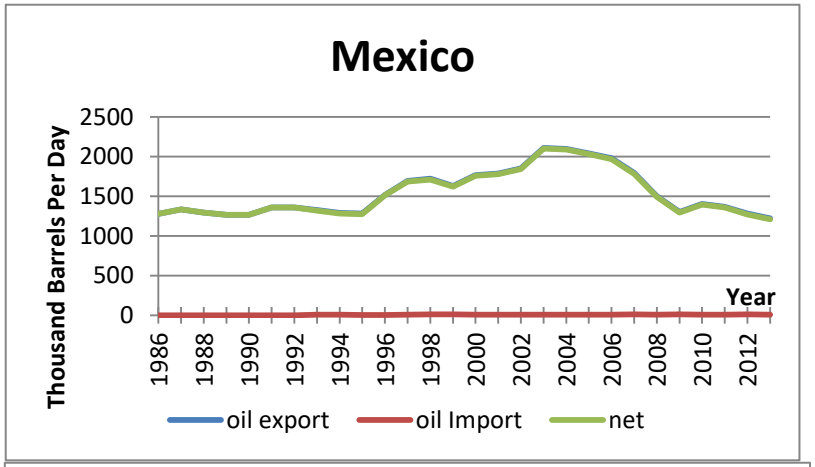
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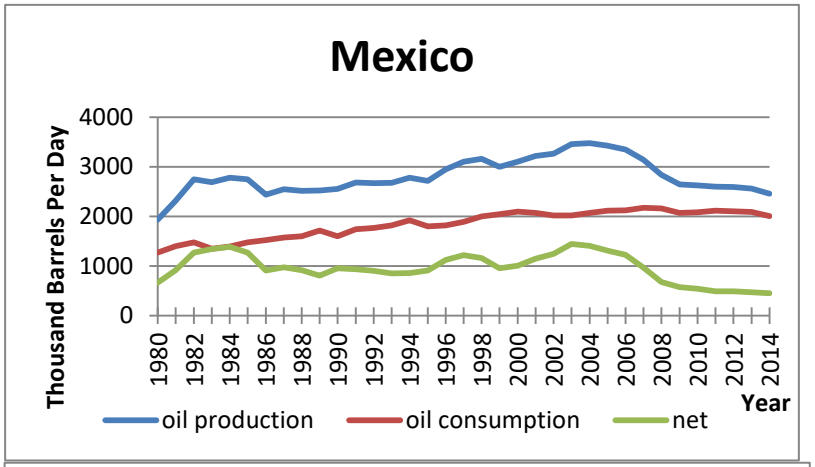
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1000
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Year
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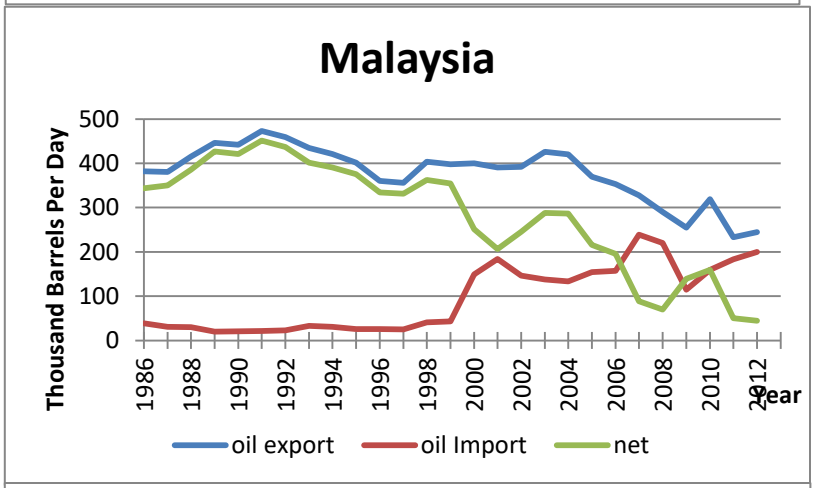
2012
2014
oil production
oil consumption
net


Malaysia
Thousand Barrels Per Day
500
400
300
200
100
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Year
1986
1988
1990
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2002
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2006
2008
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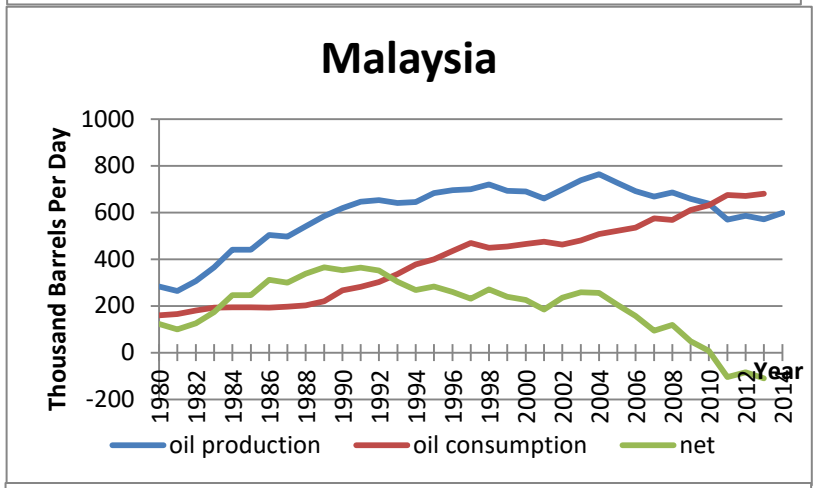
oil export
oil Import
net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Thousand Barrels Per Day
1000
800
600
400
200
0
-200
Year
1980
1982
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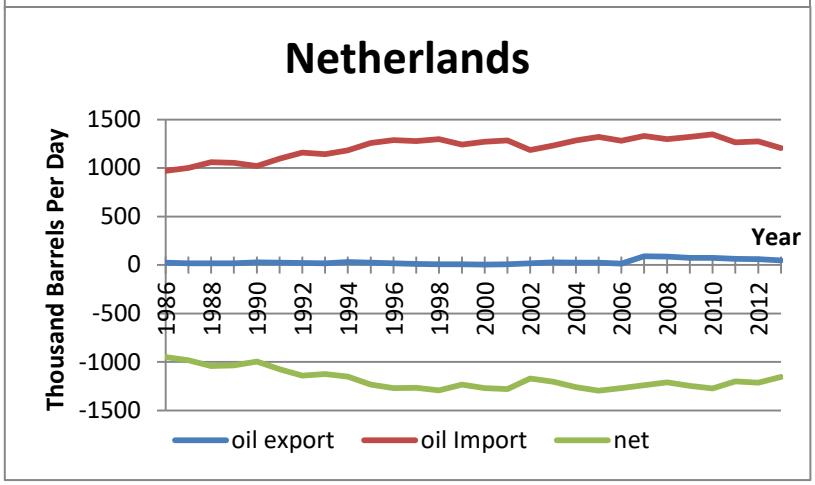
oil production
oil consumption
net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Thousand Barrels Per Day
1500
1000
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-500
-1000
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Year
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2004
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2008
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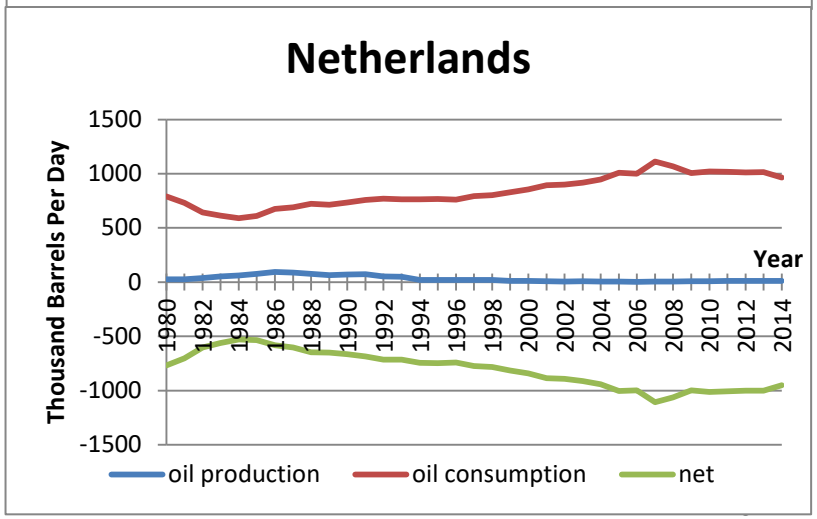
oil export
oil Import
net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-1500
Year
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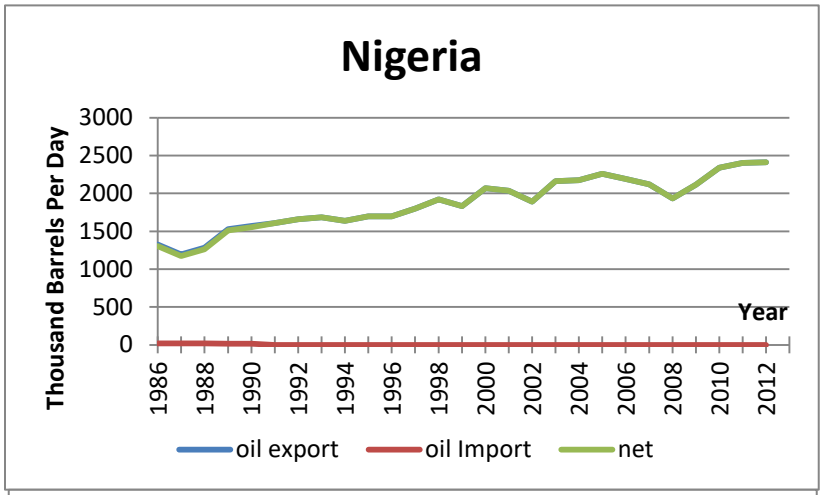
oil production
oil consumption
net


Nigeria
Thousand Barrels Per Day
3000
2500
2000
1500
1000
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Year
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2008
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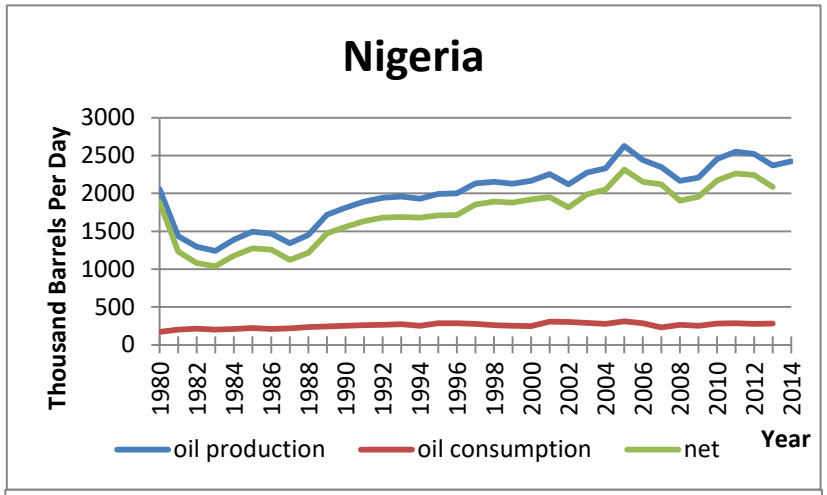
oil export
oil Import
net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Thousand Barrels Per Day
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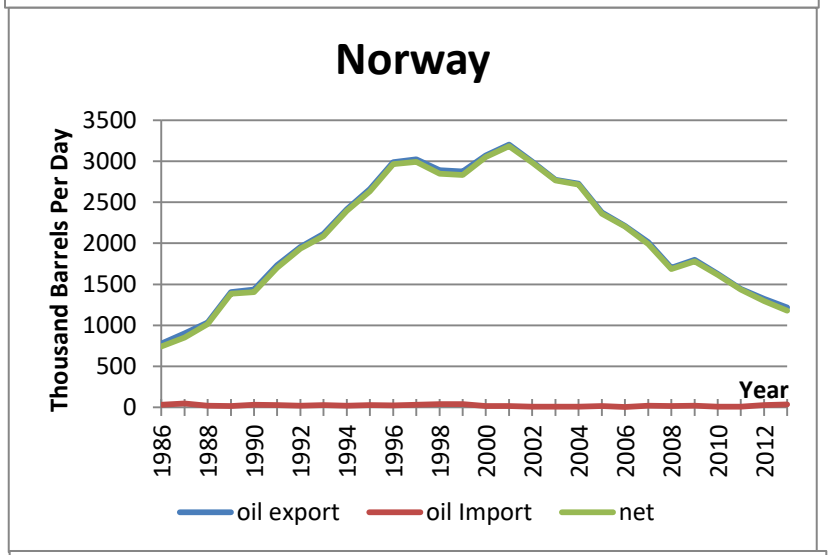
Year
oil production
oil consumption
net


Norway
Thousand Barrels Per Day
3500
3000
2500
2000
1500
1000
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Year
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2002
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2006
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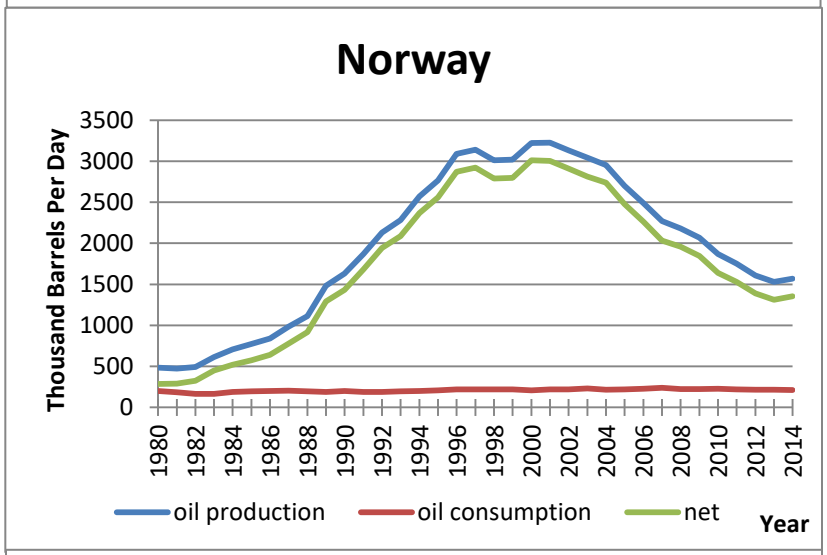
2010
2012
oil export
oil Import
net


Norway
Thousand Barrels Per Day
3500
3000
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1500
1000
500
0
1980
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2010
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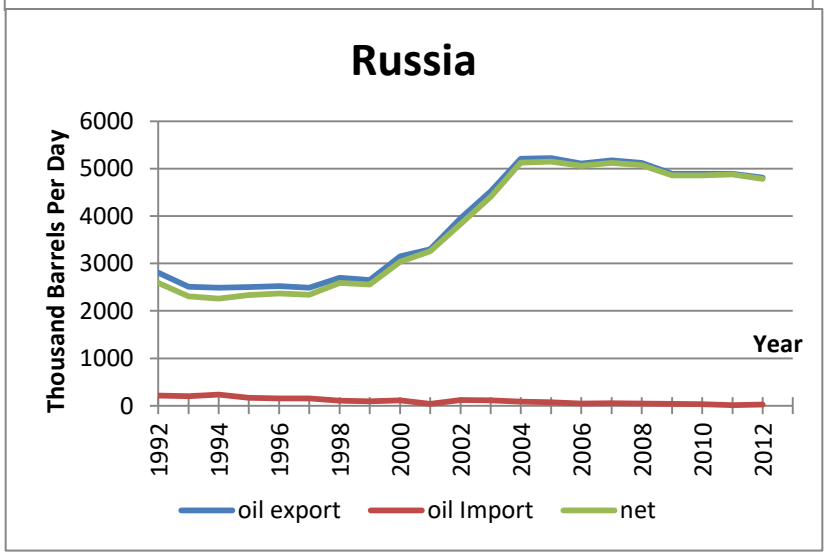
Year
oil production
oil consumption
net


Russia
Thousand Barrels Per Day
6000
5000
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Year
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1994
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2006
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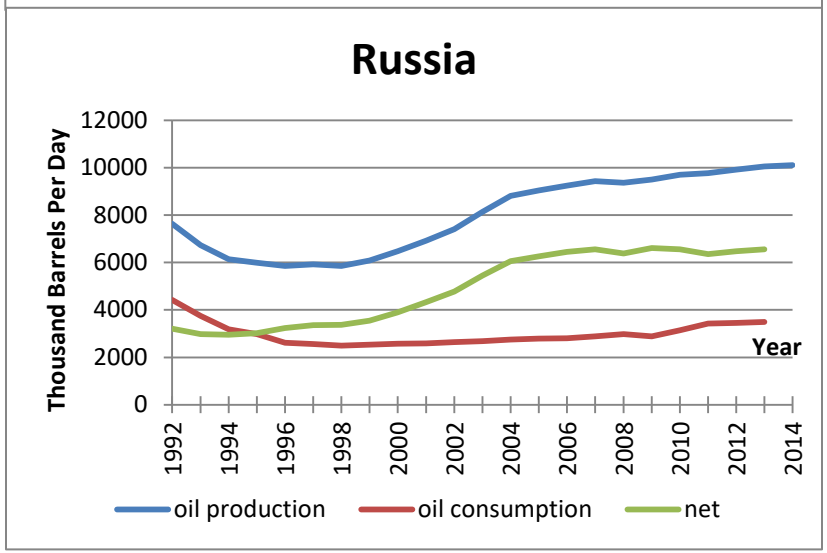
2012
oil export
oil Import
net


Russia
Thousand Barrels Per Day
12000
10000
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2004
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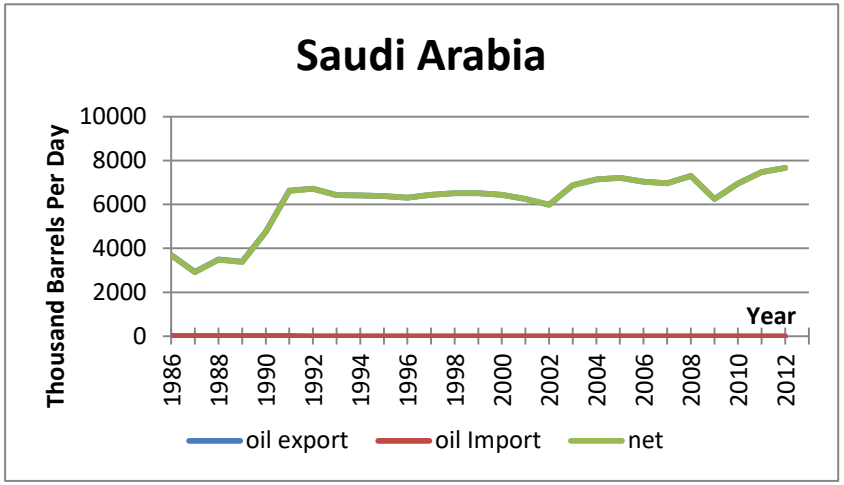
2008
2010
2012
2014
Year
oil production
oil consumption
net


Saudi Arabia
Thousand Barrels Per Day
10000
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6000
4000
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Year
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oil export
oil Import
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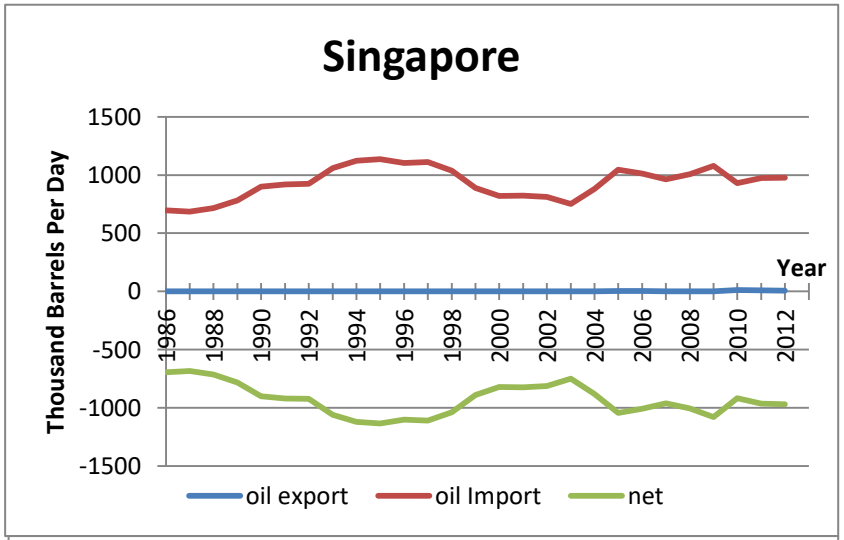
Singapore
Thousand Barrels Per Day
1500
1000
500
0
-500
-1000
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Year
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2008
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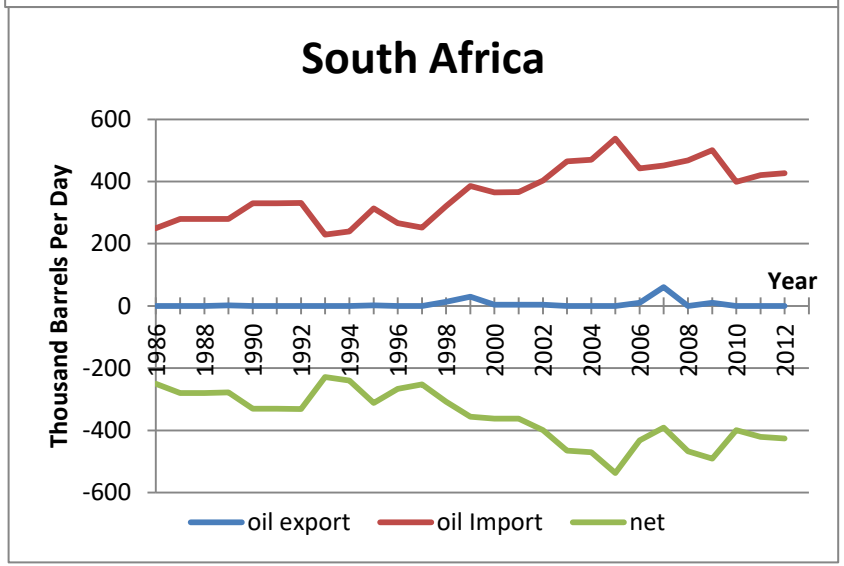
2012
oil export
oil Import
net


South Africa
Thousand Barrels Per Day
600
400
200
0
-200
-400
-600
Year
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2004
2006
2008
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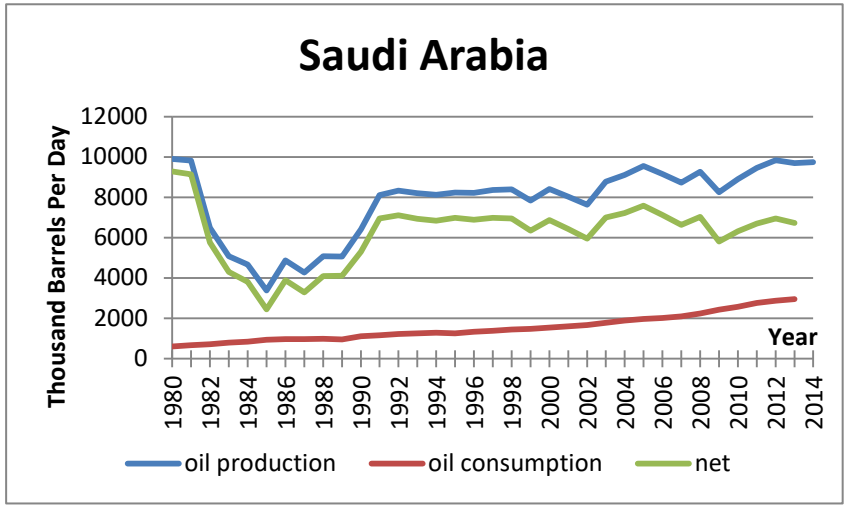
2012
oil export
oil Import
net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Thousand Barrels Per Day
12000
10000
8000
6000
4000
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0
Year
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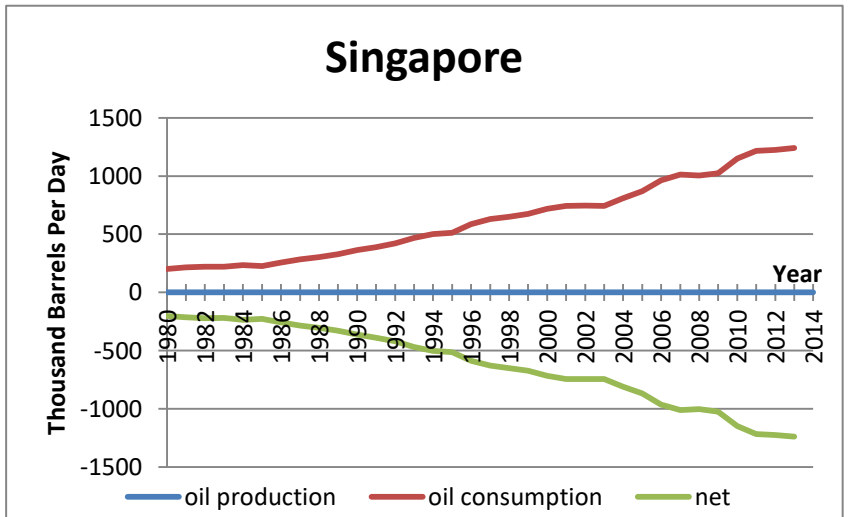
oil production
oil consumption
net


Singapore
Thousand Barrels Per Day
1500
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-1500
Year
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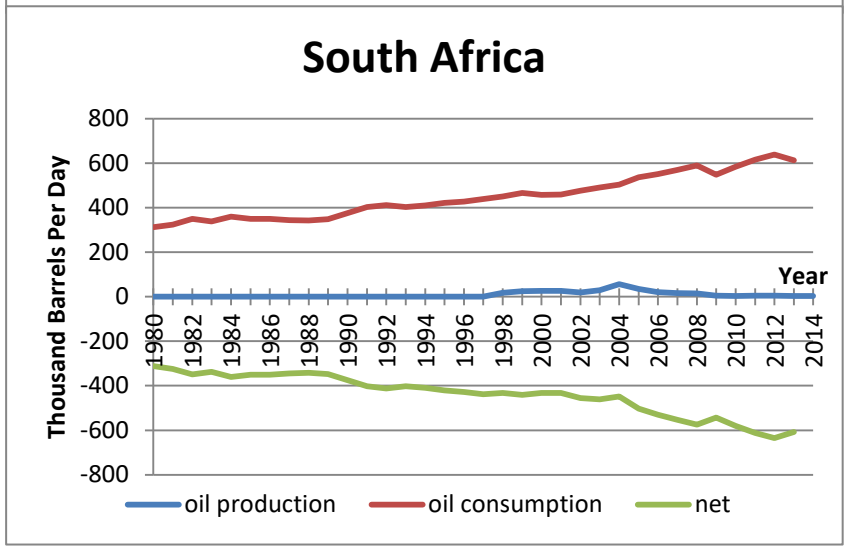
oil production
oil consumption
net


South Africa
Thousand Barrels Per Day
800
600
400
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0
-200
-400
-600
-800
Year
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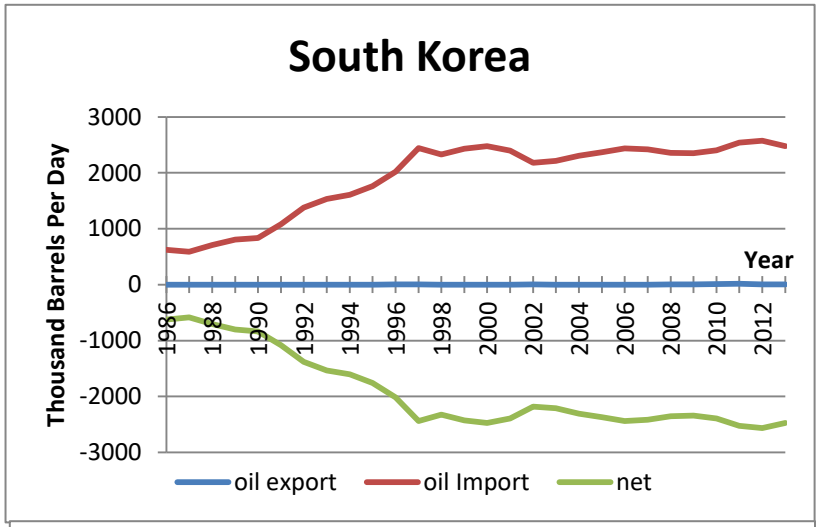
oil production
oil consumption
net


South Korea
Thousand Barrels Per Day
3000
2000
1000
0
-1000
-2000
-3000
Year
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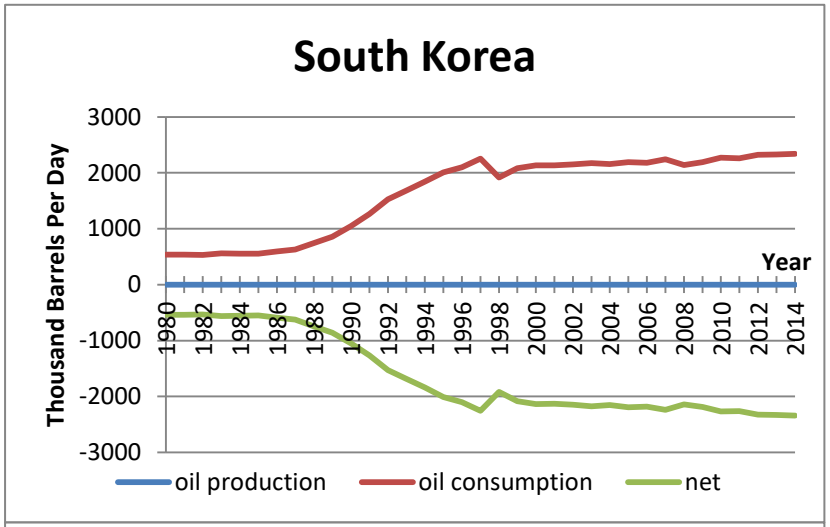
2004
2006
2008
2010
2012
oil export
oil Import
net


South Korea
Thousand Barrels Per Day
3000
2000
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0
-1000
-2000
-3000
Year
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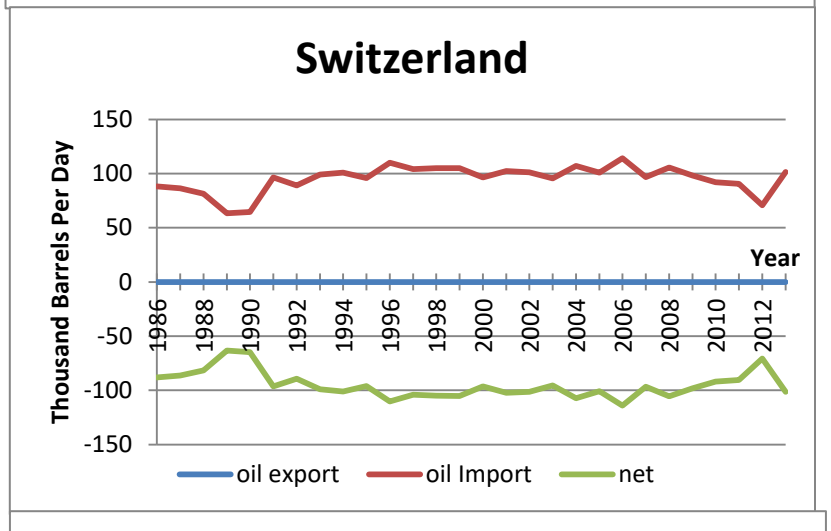
oil production
oil consumption
net


Switzerland
Thousand Barrels Per Day
150
100
50
0
-50
-100
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Year
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1992
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1996
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2006
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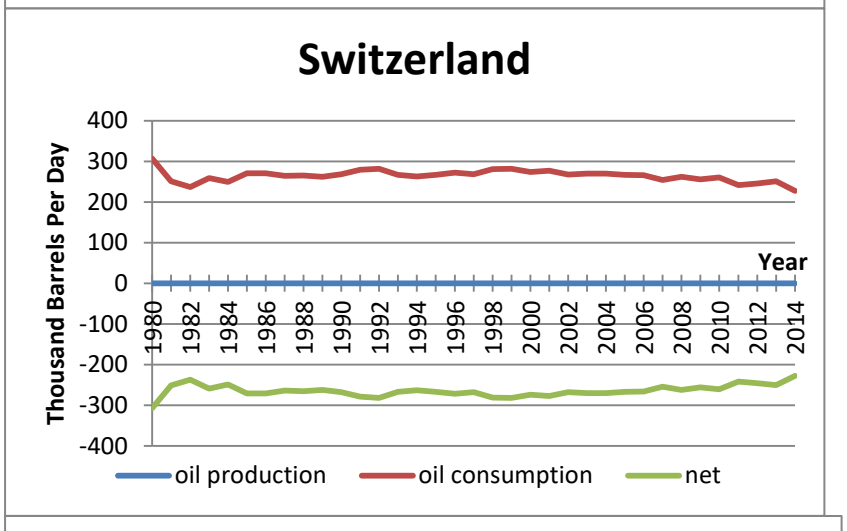
2010
2012
oil export
oil Import
net


Switzerland
Thousand Barrels Per Day
400
300
200
100
0
-100
-200
-300
-400
Year
1980
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1992
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2006
2008
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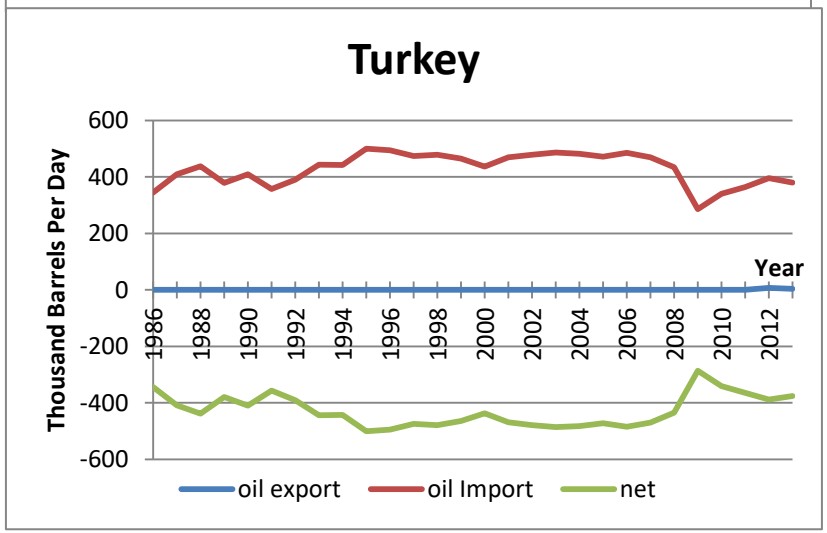
2012
2014
oil production
oil consumption
net


Turkey
Thousand Barrels Per Day
600
400
200
0
-200
-400
-600
Year
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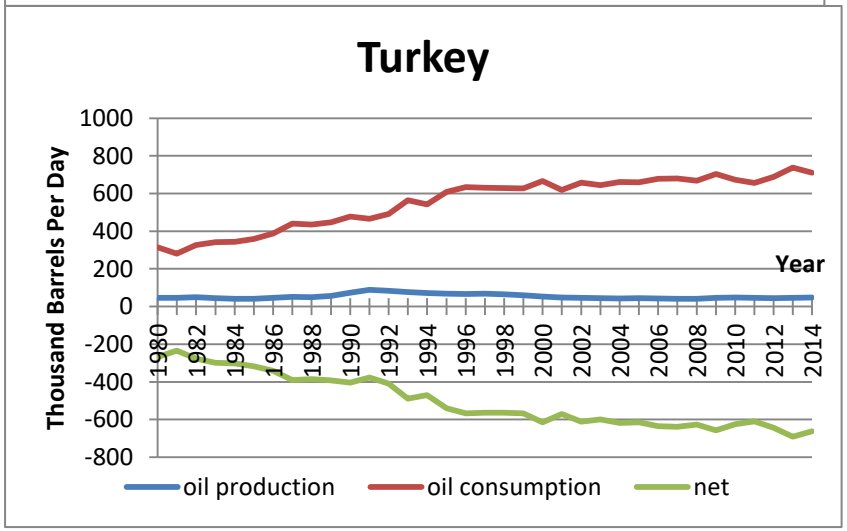
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
oil export
oil Import
net


Turkey
Thousand Barrels Per Day
1000
800
600
400
200
0
-200
-400
-600
-800
Year
1980
1982
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1988
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2000
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2004
2006
2008
2010
2012
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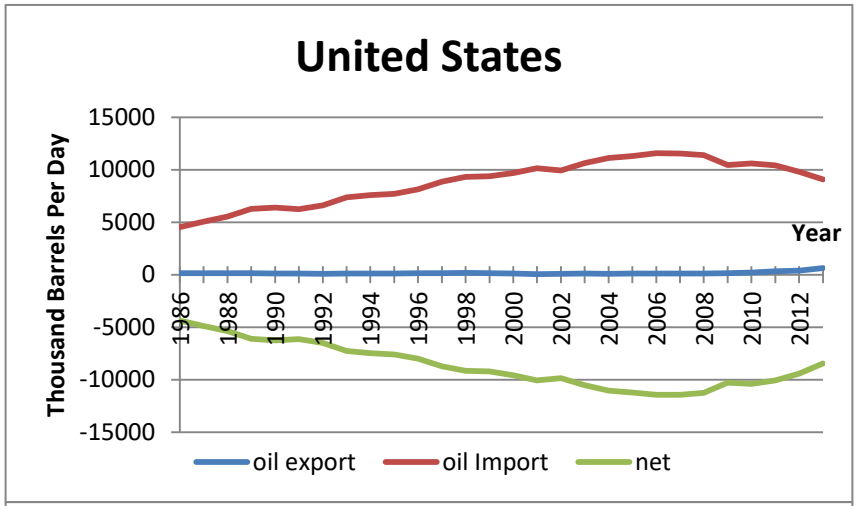
oil production
oil consumption
net


United States
Thousand Barrels Per Day
15000
10000
5000
0
-5000
-10000
-15000
1986
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1992
1994
1996
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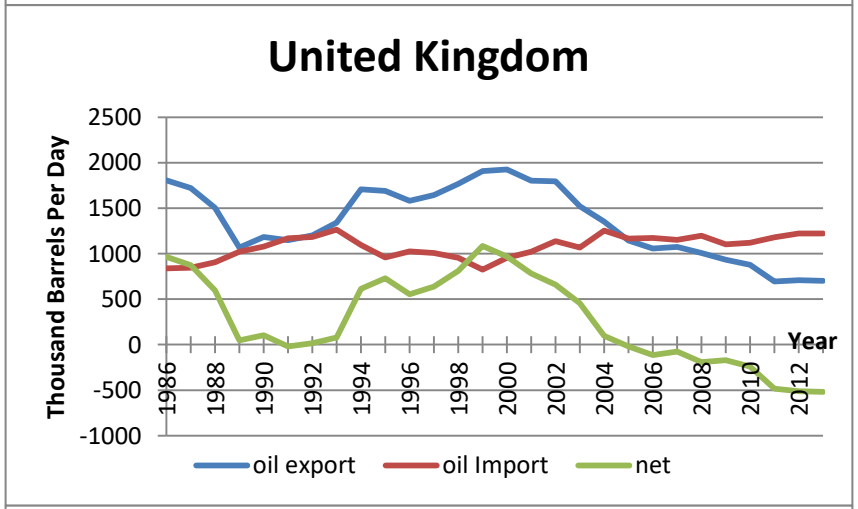
2000
2002
2004
2006
2008
2010
2012
Year
oil export
oil Import
net


United Kingdom
Thousand Barrels Per Day
2500
2000
1500
1000
500
0
-500
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1986
1988
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1992
1994
1996
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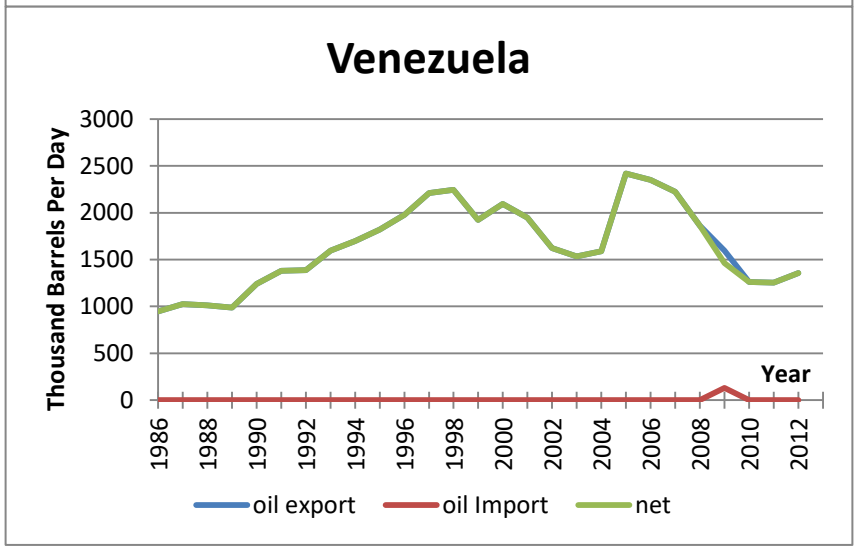
2002
2004
2006
2008
2010
2012
Year
oil export
oil Import
net


Venezuela
Thousand Barrels Per Day
3000
2500
2000
1500
1000
500
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1990
1992
1994
1996
1998
2000
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2006
2008
2010
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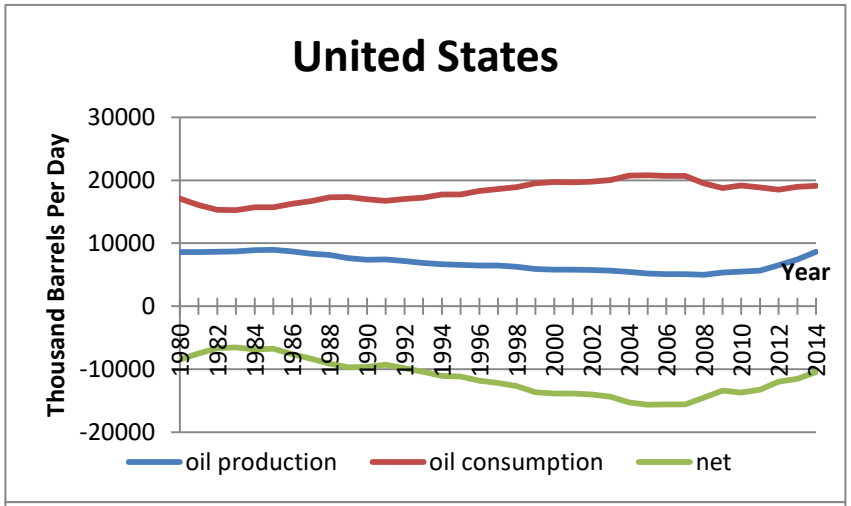
Year
oil export
oil Import
net


United States
Thousand Barrels Per Day
30000
20000
10000
0
-10000
-20000
1980
1982
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2000
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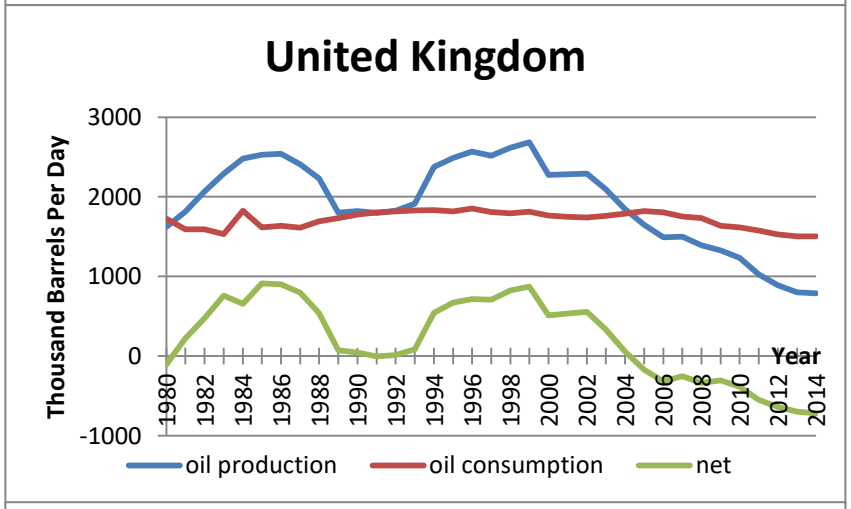
2004
2006
2008
2010
2012
2014
Year
oil production
oil consumption
net


United Kingdom
Thousand Barrels Per Day
3000
2000
1000
0
-1000
1980
1982
1984
1986
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1998
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2004
2006
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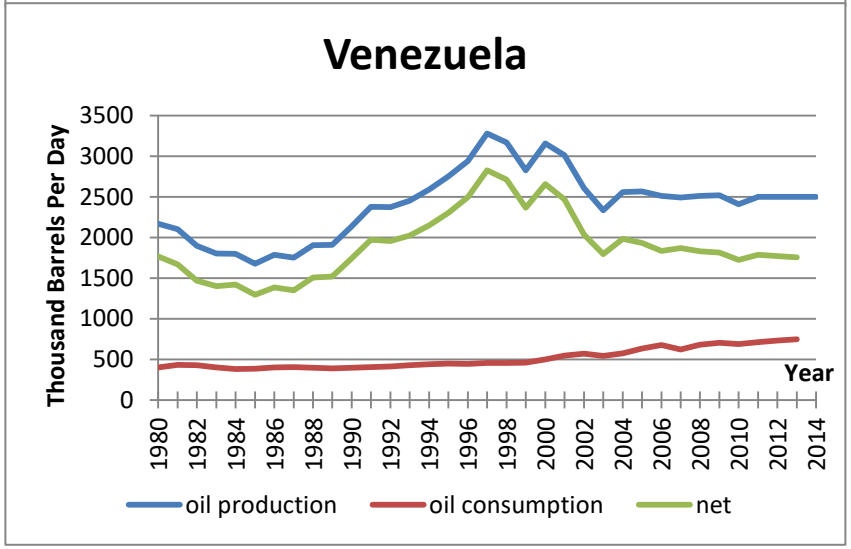
2010
2012
2014
Year
oil production
oil consumption
net


Venezuela
Thousand Barrels Per Day
3500
3000
2500
2000
1500
1000
500
0
1980
1982
1984
1986
1988
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1992
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1996
1998
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2002
2004
2006
2008
2010
2012
2014
Year
oil production
oil consumption
net

TABLE 3 – Asymptotic critical value bounds

	F-statistic							t-statistic					
K (number of regressors)	Critical values at 10% level of significance		Critical values at 5% level of significance		Critical values at 1% level of significance			Critical values at 10% level of significance		Critical values at 5%t level of significance		Critical values at 1% level of significance	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
6	2.12	3.23	2.45	3.61	3.15	4.43		-2.57	-4.04	-2.86	-4.38	-3.43	-4.99

Derived from Pesaran et al. (2001, p.300&303) Table CI(iii) & Table CII(iii) Case III: Unrestricted intercept and no trend

TABLE 9 – ARDL Bound Test Result

	K	F		t
Australia	6	37.038		-15.878
Austria	6	77.348		-19.506
Belgium	6	21.247		-11.5
Brazil	6	24.094		-12.612
Canada	6	43.965		-15.917
China	6	22.011		-11.672
France	6	221.434		-31.697
Germany	6	63.708		-16.015
India	6	5.964		-6.104
Indonesia	6	25.63		-12.798
Japan	6	11.514		-8.855
Malaysia	6	22.256		-12.141
Mexico	6	16.242		-10.304
Netherlands	6	48.195		-17.948
Nigeria	6	22.058		-12.308
Norway	6	46.598		-16.973
Russia	6	27.854		-13.679
Saudi Arabia	6	19.653		-11.454
South Africa	6	23.202		-11.527
South Korea	6	29.256		-14.106
Singapore	6	25.98		-11.383
Switzerland	6	29.657		-12.261
Turkey	6	58.01		-19.706
UK	6	54.997		-19.349
USA	6	922.053		-42.661
Venezuela	6	9.894		-7.789

Note: k stands for the number of regressors;
Asymptotic critical value bounds are obtained from Pesaran et al. (2001, p.300&303)
Table CI(iii) & Table CII(iii) Case III: Unrestricted intercept and no trend

The relevant critical value bounds for the F-statistic are
Lower bound I(0) = 2.12 and Upper bound I(1) = 3.23 at 10% significance level.
Lower bound I(0) = 2.45 and Upper bound I(1) = 3.61 at 5% significance level.
Lower bound I(0) = 3.15 and Upper bound I(1) = 4.43 at 1% significance level.

The relevant critical value bounds for the t-statistic are
Lower bound I(0) = -2.57 and Upper bound I(1) = -4.04 at 10% significance level.
Lower bound I(0) = -2.86 and Upper bound I(1) = -4.38 at 5% significance level.
Lower bound I(0) = -3.43 and Upper bound I(1) = -4.99 at 1% significance level.

TABLE 12 – Comparison of Results from Different Methods

	OLS	**ARDL long-term**	**ARDL short-term**		
	$\boldsymbol{Ro}$	$\boldsymbol{Ro}$	$\boldsymbol{\Delta Ro}$		
Australia	-0.0119 (-0.59)	-0.00570 (-0.31)	-0.00650 (-0.30)	Net Importer	Developed
Austria	0.0764** (2.41)	0.0955*** (2.72)	0.0889*** (2.67)	Importer	Developed
Belgium	-0.0837*** (-3.31)	-0.0322 (-1.52)	-0.0393 (-1.56)	Importer	Developed
Brazil	0.0500 (1.22)	0.0917** (2.11)	0.0963** (2.07)	Net Exporter	Developing
Canada	0.093*** (4.85)	0.0817*** (5.01)	0.0991*** (5.07)	Net Exporter	Developed
China	0.1157* (1.79)	-0.369** (-2.28)	-0.00561 (-0.08)	Importer	Developing
France	-0.0396* (-1.76)	-0.0119 (-0.44)	0.0179 (0.78)	Importer	Developed
Germany	-0.0682** (-2.33)	-0.0898*** (-3.24)	-0.0373 (-1.47)	Importer	Developed
India	0.0823* (1.56)	-0.192* (-2.01)	-0.0298 (-0.39)	Importer	Developing
Indonesia	0.0642* (1.54)	0.0587* (1.94)	0.0710* (1.94)	Net Exporter	Developing
Japan	-0.0101 (-0.3)	0.000952 (0.04)	0.00124 (0.04)	Importer	Developed

Malaysia	0.0145 (0.46)	0.00883 (0.33)	0.00993 (0.33)	Net Exporter	Developing
Mexico	0.0244 (0.75)	0.0318 (1.05)	0.0364 (1.05)	Exporter	Developing
Netherlands	-0.0086 (-0.34)	0.0389** (2.49)	0.0504** (2.50)	Importer	Developed
Nigeria	0.1399*** (2.56)	0.159** (2.20)	0.173** (2.22)	Exporter	Developing
Norway	0.1366*** (4.88)	0.161*** (6.27)	0.185*** (6.38)	Exporter	Developed
Russia	-0.3003 (-0.94)	0.0663 (0.63)	0.128* (1.94)	Exporter	Developing
Saudi Arabia	0.1584*** (2.96)	0.150* (1.93)	0.162* (1.93)	Exporter	Developing
South Africa	0.081** (2.85)	0.0852*** (3.77)	0.123*** (3.88)	Importer	Developed
South Korea	0.0420 (1.04)	-0.154* (-1.74)	0.0668 (1.59)	Importer	Developing
Singapore	0.0387 (1.28)	-0.00799 (-0.14)	0.0195 (0.65)	Importer	Developed
Switzerland	-0.1008*** (-4.58)	-0.0768*** (-3.91)	-0.0793*** (-4.04)	Importer	Developed
Turkey	-0.1511* (-1.69)	-0.279*** (-4.12)	-0.179*** (-2.70)	Importer	Developing
UK	-0.0180 (-1.15)	0.0130 (1.47)	0.0172 (1.48)	Net Importer	Developed
USA	-0.0331*** (-3.55)	-0.0194** (-2.08)	-0.0207** (-2.09)	Importer	Developed
Venezuela	-0.0208 (-0.2)	0.148 (0.98)	0.109 (1.01)	Exporter	Developing

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

TABLE 13 – Largest Exporters of Crude Oil including Lease Condensate in 2012

Country	Thousand Barrels Per Day
Saudi Arabia	7657.927
Russia	4807.157
Canada	2732.976 (2013)
Nigeria	2410.571
Venezuela	1357.937
Mexico	1220.379 (2013)
Norway	1218.018 (2013)
United Kingdom	703.138 (2013)
United States	629.4027
Brazil	533.3
Indonesia	296.08
Malaysia	244.65
Australia	235.4186 (2013)

TABLE 14 – Largest Importers of Crude Oil including Lease Condensate in 2012

Country	Thousand Barrels Per Day
United States	9079.948 (2013)
China	5420.54
Japan	3723.631
India	3695.9
South Korea	2478.945 (2013)
Germany	1829.656 (2013)
United Kingdom	1220.767 (2013)
Netherlands	1204.092 (2013)
France	1128.688 (2013)
Singapore	976.1