Oil Price Shocks and Stock Markets

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ABSTRACT

This study investigates long term relationship between output, oil price and stock market movements in the selected countries from different regions for comparison purposes such as Germany, Japan, Singapore, South Africa, Turkey, UK and USA. Using annual data from 1973 to 2010, empirical analysis shows that oil and stock markets are long term determinants in these countries. It is investigated that real income in these countries converges to its long term equilibrium level at reasonable levels through the channels of oil markets, stock markets, and business environment (as proxied by industrial value added).

Keywords: Oil prices; Stock markets; Output; Bounds Tests; ECM.

ÖZ

Bu çalışmada, Almanya, Japonya, Singapur, Güney Afrika, Türkiye, İngiltere ve ABD gibi farklı bölgelerden seçilen ülkelerdeki çıktı, petrol fiyatı ve borsa hareketleri arasındaki uzun dönemli ilişkiyi araştırmayı hedeflemiştir. Çalışmada 1973 ve 2010 arası yıllık verileri kullanılarak, ampirik analiz petrol ve hisse senedi piyasaları, bu ülkelerde uzun vadeli belirleyicileri olduğunu göstermektedir. Bu ülkelerde reel gelir petrol piyasaları, hisse senedi piyasaları ve iş ortamı kanallardan makul seviyelerde uzun dönem denge düzeyine yakınsar incelenmiştir.

Anahtar Kelimeler: Petrol fiyatları; Hisse senedi piyasaları; Çıktı; Sınır testi; Hata düzeltme modeli.

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Chapter 1

INTRODUCTION

In a globalized world, understanding the relationship between oil shocks and the stock markets is an important issue. It is vital to study and understand the connection between oil prices, exchange rates, and developing stock market prices, due to the fact that these developing economies will continue to thrive and they will eventually have a greater impact on the global economy corroborated by Basher et al. (2012).

Papapetrou (2001) also suggests that while the majority of studies conducted have examined the links between the fluctuations of oil prices and economic activity, it is shocking to see that few researches have been conducted to examine the connection between the financial market and oil price shocks and they have been limited to advanced industrial countries such as the United Kingdom, the United States, Japan, and Canada. This indicates that, the relationship between oil shocks and stock markets in developing countries should be researched. Oil prices have risen and fallen sharply within the last thirty years. To demonstrate, we can take a look at the 76% increase in oil prices between March 2007 and July 2008 contrary to the 48% decrease in prices between July and October in 2008. Therefore, it makes sense to observe how oil prices influence the macro-economic variables. In numerous developed countries, it has been proven that oil prices play a key role in economic activity as stated by Arouri and Fouguau (2009).

A growing demand for oil results in a boost in oil prices, given that no changes are made to the oil being supplied. The increased price then affects producers as well as customers, just like an inflation tax, by

1) Leaving less disposable income for consumers to spend on other commodities and services.

2) Increasing the costs of companies which are outside the oil industry, yet instead of passing on the added cost to the customers, forcing companies to cut down from their profit and dividends which play an important role in stock prices.

As a result, changes in oil prices have more effect on stock prices and profits in developing economies (Basher and Sadorsky, 2006). Also, according to the argument of Park and Ratti (2008) if sudden and extreme oil price changes are able to affect the real economy due to consumer and firm behaviour, then these results should noticeably be reflected onto the world stock market. For these reasons, oil price changes should be carefully examined.

It was also observed by Hamilton (1983) that crude oil shocks played a major role in the recession in the US after the World War II. Subsequently, describing the relationship between crude oil prices and the macro-economy has been a theoretical and practical apprehension. It is known that there have been times when stock prices have had some dramatic changes. The sudden increase in crude oil prices between 1973 and 1974, the crash of the stock market in 1987, the invasion of Kuwait by Iraq towards the end of 1992, the currency disaster in East Asia in 1997, the terrorist attack in the U.S.A on September 11th, and most recently, the 2007-2008 rise in crude oil prices accompanied by the financial crises during these years are only some examples of such changes which were illustrated by Aloui and Jammazi (2009).

The resulting situation is that the costs of factor inputs influencing many listed firms can be potentially affected by energy prices in general and particularly oil prices, which consequently influences the rise and fall of their stock prices just as corroborated by Aloui and Jammazi (2009).

1.1 Aim and Contribution of the Study

The aim of this study is to investigate the long term relationship between real income, oil price movements and various stock indices such as within Frankfurt, Tokyo, Singapore, Johannesburg, Istanbul Stock Exchange, London and New York by using contemporary econometric methods.

The reason behind studying this subject is because there are many studies including the impact of oil prices on economic activities; there is little evidence on the joint impact of oil prices on stock markets on real income of countries. Therefore, analyzing this type of relationship would be an interesting research area.

Furthermore, many previous studies have focused on the developed and emerging markets; therefore, this thesis focuses on both developed and developing economies for comparison purposes. For this reason, this study is based on Frankfurt, Tokyo, Singapore, Johannesburg, Istanbul Stock Exchange, London and New York Stock Exchange Markets. Finally, this study is expected to be of great importance for businessmen, scholars and politicians as it analyses the relationship between oil shocks and stock markets and offers an economic analysis on this issue.

1.2 Structure of the Study

The present study is structured as follows: In Chapter 2, theoretical and empirical literatures are discussed. Chapter 3 gives some brief information about Stock

Markets in history. Data and methodology of econometric analysis is presented in Chapter 4. Chapter 5 shows results of econometric analysis and in Chapter 6 conclusion is made and some policy implications are discussed.

Chapter 2

LITERATURE REVIEW

There are numerous studies in the literature that analyze the link between oil prices, stock markets, and the macro economies. This chapter will present a summary of previous works in the relevant literature.

Hamilton (1983) examines the relationship between the oil prices and macroeconomic variables. He mentions that changes in oil prices have caused recession in American economy. Boyer and Filion (2007) evaluates the financial factors of the stock returns of Canadian oil and gas companies. They discover that the profit of the Canadian energy stock is in direct proportion with the return of the Canadian stock market. Between the years 1971-2008, Miller and Ratti (2009) examines the connection between world price of crude oil and international stock markets. During 1971-1980 and 1988-1999 a long-run relationship has been observed in six OECD countries. Miller and Ratti (2009) claim that over a longer period of time, the stock market indices will be affected negatively by the increase in oil prices.

Gronwald et al. (2009) researched on the consequences of oil price shocks on macroeconomic variables, like real GDP, inflation and the Kazakh economy’s real exchange rates. The first key finding was that oil prices were determined by numerous factors, which causes a significantly instable economy. The second key finding was that all the macroeconomic variables included in the study of Gronwald et al. (2009) reacted negatively to the fall of oil prices. The final key finding was that there was a relationship between the Kazakh oil market and its macro economy.

Papapetrou (2001) examines oil and real stock prices, interest rates, real economic activity and employment in order to figure out the connection between these elements for Greece and concludes that the changes in oil prices influence real economic activity and employment. Basher et al. (2012) examine the association between oil prices, exchange rates and developing stock market prices. The evidence has proven that a rise in developing stock prices causes an increase in oil prices.

Aloui and Jammazi (2009) study the connection between crude oil shocks and stock markets. Stock markets of the UK, France, and Japan showed reasonable results between January 1989 and December 2007. Two main forms of behaviour were observed where the variance regime was relative to low mean/high variance for one, while the other to a high mean/low variance regime. These results demonstrate that the increase in oil prices plays a major role in shaping the instability of stock returns as well as the likelihood of change across regimes.

Arouri and Nguyen (2010) analyze the relationship between the oil and stock markets. The results prove that stock returns respond differently to oil price changes, mainly because of its dependence on the activity sector. Zhu et al. (2011) examine the approaches of threshold co-integration to understand the connection between stock markets and crude oil shocks from January 1995 to December 2009 for OECD panels, as well as non-OECD panels, resulting in the finding that crude oil prices and stock prices affect each other positively over a long period of time. Chen et al. (1986)

examine the chances of improvements in macroeconomic variables being a risk that is then rewarded in the stock market. The conclusion they have arrived is that market portfolio is not valued independent from aggregate consumption.

Jones and Kaul (1996) examine to see whether changes in anticipated returns changes in real cash flow at present and in the future influence the international stock markets response to oil shocks. In the U.S and Canada, stock prices changes can be solely connected to the oil shocks and the influence of the shocks on real cash flow, for the post-war period. Huang et al. (1996) study the contemporary correlations of the daily returns of future oil contracts to the daily to stock returns. During the 1980s, it is shocking to see that the correlation between oil future returns and other stock indexes are practically non-existent. However, a contemporary correlation and substantial one-day lead of oil futures returns seem to apply for specific oil stocks.

Sadorsky (1999) analyzes the relationship between oil price shocks and stock market activity. He states vector auto regression outcomes prove that real stock returns are majorly influenced by oil prices and pile price volatility. Basher and Sadorsky (2006) examine what influence oil price changes have on a great set of developing stock market returns. The results they find prove that stock price returns in developing markets are influenced by oil price risk.

Bittlingmayer (2006) finds negative connection between oil prices and U.S. equity prices that may be the result of the stock market’s response to the involvement of the U.S’s participation in the war in the Middle East as opposed to higher oil prices. Since 1996, Jones et al. (2003) have been researching the influences of the oil price shocks on the economy. They suggest that there is a nonlinear relationship between oil price shocks and GDP.

It is clearly seen that results on the debate between output, oil markets, and stock markets are mixed and they vary across countries, markets, methodology employed, and data used. The next chapter will present brief information about markets that were selected in this thesis.

Chapter 3

STOCK EXCHANGE MARKETS

3.1 The New York Stock Exchange

The NYSE which connotes New York Stock Exchange is an organization that operates from the New York in the United States of America. Obviously, by market capitalization of over fourteen trillion United States Dollars of the make-up companies, the New York Stock Exchange is ranked as the world largest Stock Exchange considering especially the average daily trading estimates of one hundred and three billion United States Dollars in the year 2008. The merger of NYSE with Euronext which is electronic stock exchange in the year 2007 gives birth to NYSE Euronext (NYSE:NYX), a pilot engine for the New York Stock Exchange. The history of the NYSE begins with an idea and law about buying and selling of bonds and shares by twenty-four stockbrokers on May 17 of the year 1792 was conceived, agreed upon and signed into law right outside the number 68 at Wall Street under a make shift tree-like confinement. This agreement was made a constitution on March 8th of 1817 which brought about the new organization in the name of the New York Stock and Exchange Board. Hence, since 1868, the membership of the NYSE has been preserved and as well valued as a membership-only organization until April of 2006 when the NYSE became an electronic made public. Before this time, membership authorization which can only be purchased is also strictly limited to an aggregate of one thousand three-hundred and sixty six. (Wikipedia, 2012).

The merger of the NYSE with the public limited Archipelago electronic stock exchange gives birth to the NYSE Group incorporation which hence has its shares been traded by the NYSE:NYX. The new NYSE:NYX was eventually incorporated with the American Stock Exchange in the year 2008. This brought to an end the two-century trading of the American Stock Exchange (Amex) outside the NYSE and hence the usual name “curb market” became an old adage. Notable events that characterized the NYSE includes the start of World War I precisely on July 13 of 1914, the NYSE was briefly closed for operation and also shortly re-opened on November 28 for bond trading before permanently opened for total trading in mid-December of the same year. The Great Depression was believed to have been caused and made worse by the crash popularly called the Black Thursday of the Exchange on October 22, 1924. Succeeding these notable events in the NYSE was the registration of the Exchange as a national security exchange with the United States Securities and Exchange Commission with presiding officers of thirty-three member boards and a president on October 1 of 1934. For the NYSE Euronext New York Exchange that has its normal trading hours from 9:30am to 4:00pm, its affiliates include the NYSE Arca, NYSE Amex and ArcaEdge. Also among the Trading Faculties are the NYSE Euronext, NYSE Bonds and The New York Block Exchange. (Wikipedia, 2012).

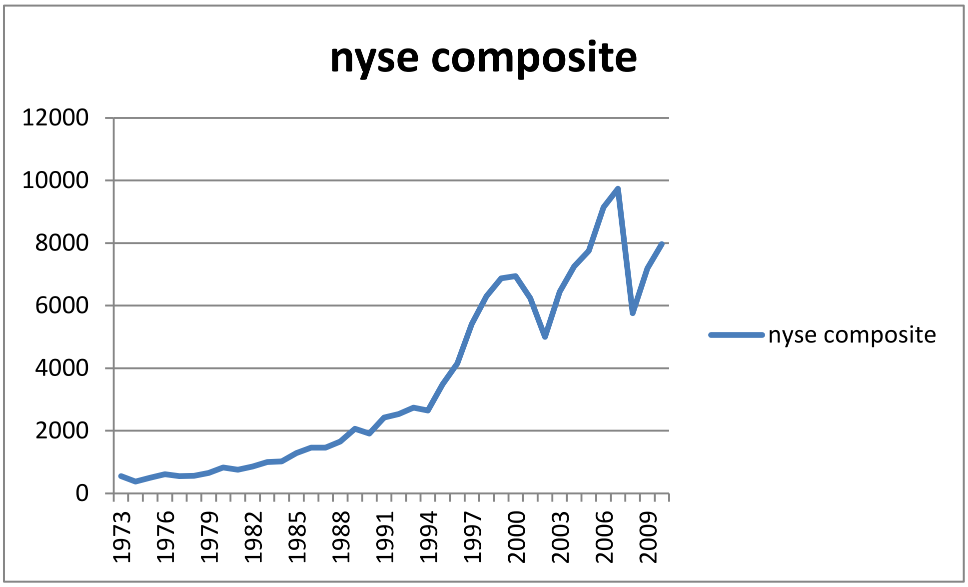

Figure 3.1 NYSE Composite Index 1973-2010

The annual distribution of stock index prices was examined and it can be understood that America is the most consistent country in the world. Although there has been some amount of decrease in America as well, still there is an increasing schedule. Moreover, USA reached the highest level in 2007 and after that great performance, it faced with world economic crisis, so this country was also adversely affected by the crisis to a certain extent. And the lowest level of America was in 1974.

3.2 The Tokyo Stock Exchange

Tokyo-based Exchange in Japan, the Tokyo Stock Exchange (TSE) is the world's third largest Stock Exchange by total market capitalization of the number of listed companies. Its total market capitalization of the 2,292 listed companies is put at US$3.3 trillion by December of 2011. Although trading in TSE began on June 1 of 1878 but the history of TSE is dated back to the primitive leadership of Finance Minister and capitalist advocate Okuma Shigenobu and Shibusawa Eiichi respectively under the auspices name of the Tokyo Kabushiki Torihikijo in May 15 in the year 1878. The merger with other ten Stock Exchange eventually metamorphosed into the mega Japanese Stock Exchange which was briefly closed and repositioned after the Nagasaki bombing. The post war event marked the reopening of the TSE on May 16, 1949 under a new securities exchange Act. The success of the TSE between 1983 and 1990 which subsequently makes it to account for over 60% of the global Stock market capitalization was very surprising. Although the TSE is presently still ranked among the world third largest Stock Exchange by market capitalization, the market value of its shares is presently not matching its old value. The TSE gave way for the new facility called TSE Arrows which was opened on May 9 of 2000 briefly after the exchange was closed on April 30 of the year 1999 for the introduction of an electronic trading. Moreover, the Arrowhead trading facility was introduced in the year 2010. Prior to this period precisely in the year 2001, TSE was repositioned as a Stock company and hence ceased to exist as an incorporated organization with operating members as its shareholders. The listed Stocks are classified into sections as First, Second and emerging stocks of the large companies, mid-sized companies and the high-growth start-up companies respectively. By the October 31 of the year 2010, these sections of first, second and the emerging stocks had comprises of 1,675, 437 and 182 companies respectively. This exchange that operates normally from 09:00am to 11:30am and from 12:30pm to 3:00pm has 94 domestic and 10 foreign security companies trading on its floor. Furthermore, there are numerous tracking indices that are owned by the TSE in Japan to be more specific the Nikkei 225 index of companies is maintained by the Nihon Keizai Shimbun, the J30 index of large industrial companies controlled by Japan's major broadsheet newspapers and the TOPIX index based on the share prices of First Section companies. (Wikipedia, 2012).

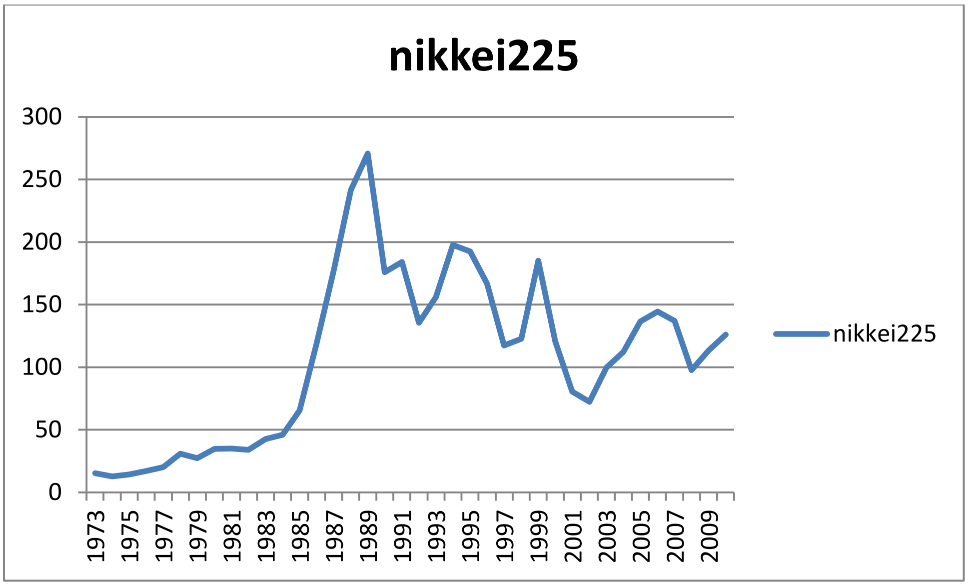

Figure 3.2 Nikkei 225 Index 1973-2010

When we analyze the chart of Japan we face a sharp rise and decline in stock index prices. The most drastic rise was in 1989 but after this year Japan has shown a sharp decline as well until 1993. After 1993, there was a small fluctuation in stock index prices .However, the interesting part of Japan chart was in 2008 economic crisis, because this country didn't get too much damage from the crisis like other countries. When we consider other years after the crisis, there are continuous growing and balanced stock index prices.

3.3 The Istanbul Stock Exchange

Istanbul Stock Exchange was established as an independent professional organization early in the year 1986. The only corporation in Turkey purported for securities exchange is the Istanbul Stock Exchange (ISE) and it ensures trading in equities, bonds and bills, revenue-sharing certificates, private sector bonds, foreign securities and real estate certificates and also international securities. The ISE operates only on workdays from 09:30am to 12:30pm and also from 14:00pm to 17:30pm and comprises of three hundred and twenty national companies that includes incorporated banks and brokerage houses. The main indicator and Index of the national market is the ISE National-100 Index which comprises the ISE National-50 and ISE National-30 Index. Other Indices includes ISE National-All Shares Index, Sector and sub-sector indices, ISE Second National Market Index, ISE New Economy Market Index and ISE Investment Trusts Index. The organized securities market in Turkey that has its history dated to the later part of the 19th century was established in 1866 and initially known as the Dersaadet Securities Exchange during the Ottoman Empire briefly after the Crimean War. Dersaadet Exchange was an attractive market for the European investors shortly before proclamation of the Turkish Republic which led to the introduction of a new law in 1929 with the name Istanbul Securities and Foreign Exchange Bourse which paved way for the reorganization of swerving capital markets. Shortly after the reorganization, the event that affects the Bourse includes the Great Depression of 1929 and the foreign influence of the World War II on businesses in Turkey. But the industrial progress in the following decades led to increase in the number of joint stock companies that are publicly limited. Both the legislative principles and institutional drive paved way for the meaningful improvement experienced in the early 80's of the activities of the Turkish capital market even before the introduction of the Capital Market Law in 1981. Also, subsequently in 1982 the main regulatory agency- the Capital Markets Board was established to coordinate and regulate the Turkish securities market before another law was introduced in 1983 to overlook into the setting up of securities exchanges in the country. And officially, the Regulations for the Establishment and Functions of Securities Exchanges was made a Gazette which led to the official inauguration of the Istanbul Stock Exchange in the later part of 1985 it was also approved by the parliament. (Wikipedia, 2012).

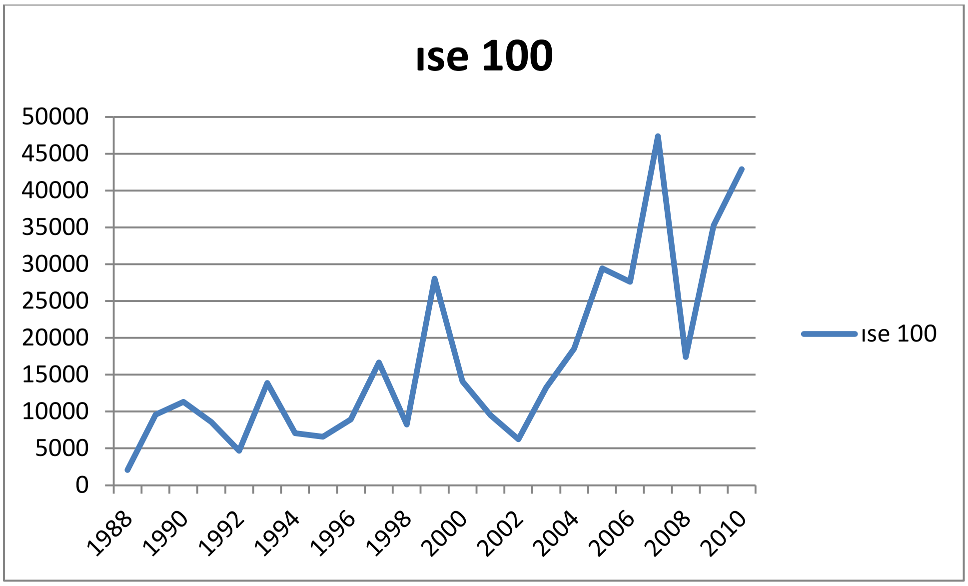

Figure 3.3 ISE-100 Index 1988-2010

In the chart of Turkey, there are really different and too many fluctuations in stock index prices over the years. The lowest level was in 1988 and the highest level was in 2007. There are sharp declines and rises in stock index prices for Turkey, but in 2007 it reached a perfect number for the country. However, the world economic crisis affected Turkey like all other countries in a bad way. Sudden ups and downs in Turkey have started to change after 2008. It can be understood from the chart that there is a good rising momentum for Turkey in stock index prices.

3.4 The London Stock Exchange

The London Stock Exchange known as the Royal Exchange was founded by Thomas Gresham in 1801 and was rated fourth largest in the world and subsequently largest in Europe having attained market capitalization of US$3.266 trillion as of December of 2011. Initially founded on the model of the Antwerp Bourse, the exchange which was commissioned by Elizabeth I in 1571 denied operations of the stockbrokers because of their unruly behaviour in the 17th century and hence only operates in locations like Jonathan's Coffee-House before relocating to Garraway’s coffee house.

The Gresham's Royal Exchange building was reconstructed and re-enacted in 1669 after been razed down by the Great fire of London. The partnership between the Financial Times and Stock Exchange in February 1984 gave birth to FTSE 100 Index, one of global most effective indices which is capable of observing the activities of 100 leading and listed companies. (Wikipedia, 2012).

The Big bang of the Exchange in the 1980s was marked with tragic deregulation of the financial market of the United Kingdom in 1986. Alternative Investment Market, the AIM was subsequently introduced in 1995 to help in producing mega and global companies. But the Exchange became a public liability in 2000 and hence had a changed status from UK Listing Authority to the Financial Services Authority (FSA-UKLA). Companies listed on the Exchange either traded on Main Market or Alternative Investment Market. Trading on the Main Market of the London Stock Exchange enhances corporate governance, adequately standard and an internationally renowned positioning. Reputable and globally recognized companies are among the more than 1300 companies from 60 different countries that enjoys these adequate provisions of the London Stock Exchange. Meanwhile smaller and growing companies are aided in its development and growth capital such that they become large and globally recognized with time as they trade on the Alternative Investment Market of the London Stock Exchange. Recently, precisely on 9th February of 2011 a new mega entity with a huge market capitalization of £3.7 trillion was formed when London Stock Exchange (LSE) merged with Toronto Stock Exchange (TMX group). Hence out of the 2938 listed companies on LSE from over 60 countries, 10 of it are quoted on Specialist Funds Market, 44 are on the Professional Securities Market and 1151 are on listed on the Alternative Investment Market of the London

Stock Exchange. Activities on the LSE by mid-2011 made it one of the world's famous growth markets especially with its Alternative Investment Market trading that accounts for more than £67 billion since 1995 and currently features activities of 56 companies from Africa, 41 from China, 26 from Latin America, 23 from Central & Eastern Europe and 29 from India & Bangladesh. With 62.2% rating of its share trading in the UK lit order book trading, the LSE recorded a daily trading of 611,941 shares with daily turnover of £4.4 billion. Presently, LSE trading in emerging markets exchange traded funds (ETFs) is the highest globally with a record of 158 emerging market ETFs as quoted in May 2011 against 126 on the New York Stock Exchange (NYSE Arca) and 93 on Deutsche Boerse. (Wikipedia, 2012).

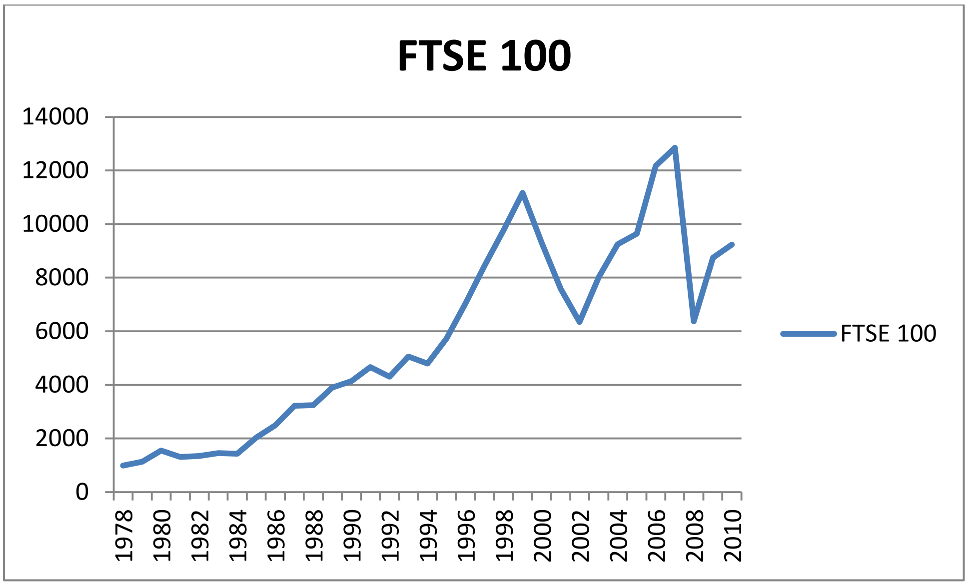

Figure 3.4 FTSE-100 Index 1978-2010

The UK has achieved the lowest level in 1978 and highest circulation in 2007. When we look at the chart, there is a steady increase until 1993. There is a slight decline in 1994 but until 1999, the UK indicates growing momentum. In 1999 the stock index prices reach closer to the summit. On the other hand, when we look at the following years, we can see some fluctuations on the prices of stock indexes. In 2008, like all other countries, the UK stock index graph indicates a decline because of crisis. But the UK is a really powerful country and it managed to recover from this quickly.

3.5 The Frankfurt Stock Exchange

With over 4,500 traders from more than 250 international trading establishments, the Frankfurt Stock Exchange is globally ranked 12th largest Stock exchange in order of market capitalization. The trading indices used by the Exchange include DAX, DAXplus, CDAX, DivDAX, LDAX, MDAX, VDAX SDAX, TecDAX and EuroStoxx 50 and its direct connection with investments generally constitute 35% of the world's investment. Today's Frankfurt Stock Exchange has a history dated to 9th century as proposed by Emperor Louis the German to hold free trade fairs in his free letter. But by 16th century the institution has well-developed and amassing huge wealth mostly from economy trade and financial services. Prior to this time, precisely in 1585 a separate establishment was made to fix currency exchange rates and in the succeeding century the Exchange became world's first Stock exchange only third to London and Paris. Later development with both domestic and international investment in the Exchange was not until after the Second World War in 1949 when the Exchange reaffirms its leading role as the stock exchange in Germany. The closure of the Bundesbank was advantageous to Frankfurt Stock Exchange in the early 1960s especially concerning Europe's financial policies before the establishment of European Union in 2002. Consequently, the presence of European Central Bank in Frankfurt Main Market has also amassed huge profit to Frankfurt Stock Exchange such that it negotiated the acquisition of the London Stock Exchange between 2002 and 2005 before the talk was stalled in 2005. (Wikipedia, 2012).

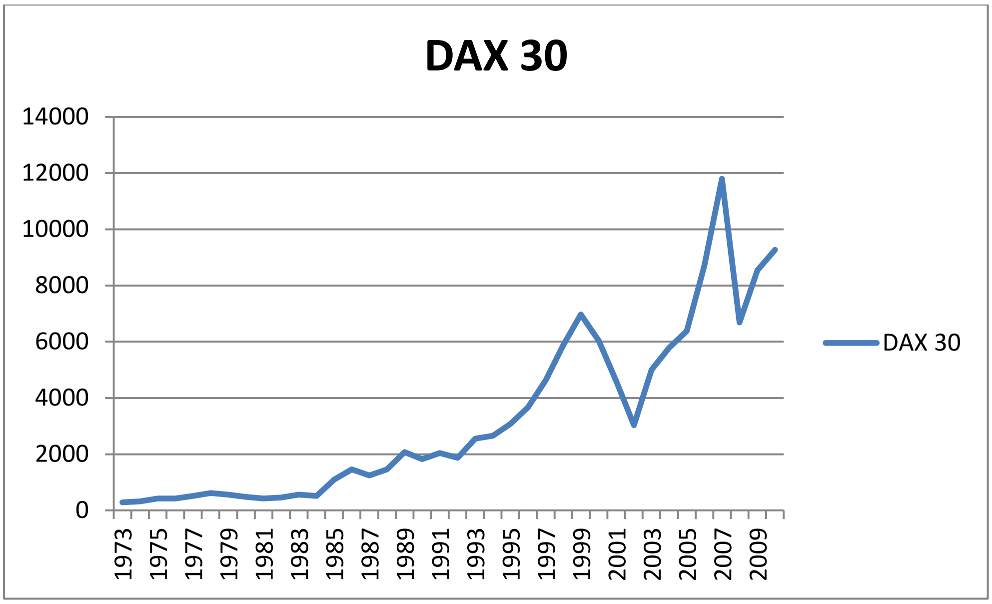

Figure 3.5 DAX-30 Index 1973-2010

Looking at the graph in Germany, its lowest level was in 1973 and it reached its highest level in 2007. The years on the chart start from 1973 to 2011 and we can see that there are not too many changes until 1999 but after that year, there is a sharp decrease or increase in stock index prices. Also, after 2001, we can see a really perfect rising in stock index prices until the highest level until 2007 but as a result of the economic crisis in year 2008, there is a sharp decline. However, the rise continues for Germany after 2009.

3.6 The Singapore Stock Exchange

SGX is Singapore Exchange limited which is an investment holding company and participate in securities and derivatives trading and others. SGX which was established in 1 December 1999 as a holding company belongs to the association of World Federation of Exchanges and the Asian and Oceania Stock Exchanges Federation. New shares issued as replacement for the cancelled shares capital of Stock Exchange of Singapore (SES), Singapore International Monetary Exchange (Simex) and Securities Clearing and Computer Services Pte Ltd (SCCS) were fully bought by SGX and also their assets became that of SGX as well as the shares of their (SES, Simex and SCCS) shareholders. Precisely on 23 November 2000, SGX became the second Asia-Pacific after Australian Securities Exchange to be quoted via a public offer and a private placement. Also, SGX stock is a fragment of the benchmark indices like the MSCI Singapore Free Index and the Straits Times Index even as it listed on its own bourse With its revenues comprising of 75% securities market and 25% derivatives market, SGX as noted on 31st January 2010 had 774 companies quoted on its Stock and also with a combined market capitalization of S$650 billion. (Wikipedia, 2012).

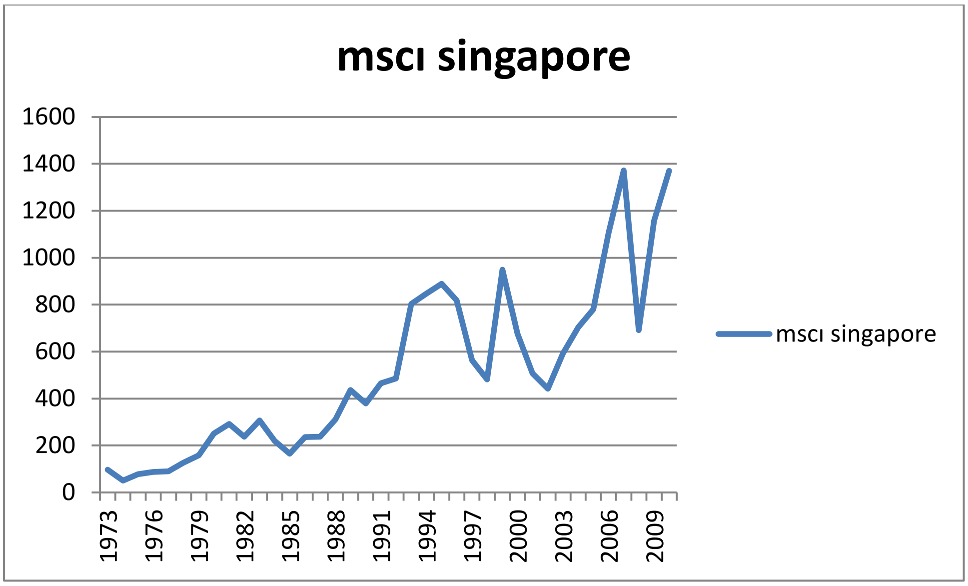

Figure 3.6 MSCI Singapore Index 1973-2010

If we examine changes in stock prices of Singapore over the years; we see that the country reached the lowest level in 1974; on the other hand it reached the highest level in 2007. This country has shown many differences over the years. Especially during the transition period of 1992-1993, it shows a perfect rising. This progress continues until 1996 but in 1997 and in the following years, stock index prices show a decline. These fluctuations continue until 2005; however, in 2006, it shows an incredible increase and in 2007, it reaches the highest level. Like_all the other countries, in 2008,_stock index prices decline because of the world economic crisis. However Singapore manages this problem immediately.

3.7 The Johannesburg Stock Exchange

With market capitalization of US$182.6 billion and an estimated 472 listed companies on its listing, Johannesburg Stock Exchange (JSE) as of 2003 was rated as the largest in Africa. By 30th September 2006 the market capitalization of JSE rose to US$579.1 billion and presently the Exchange is ranked 16th largest stock exchange globally. Benjamin Minors Woollan founded the Johannesburg Exchange & Chambers Company which later emanated into JSE in November 8, 1887 immediately after the discovery of gold in1886 on the Witwatersrand in 1886 that led to the craving for Stock Exchange activities by the industrial and financial sectors. In February of 1961 the second exchange at Hollard Street officially started operation after several years that a decision to have a new building was reached in 1947 after the Second World War. JSE became a member of Federation International Bourses de Valeurs (FIBV) in 1963 and enhances free trading of securities under a regulated procedure. TradElect which is an automated electronic trading system of the Exchange is operates with a license from the London Stock Exchange. (Wikipedia, 2012).

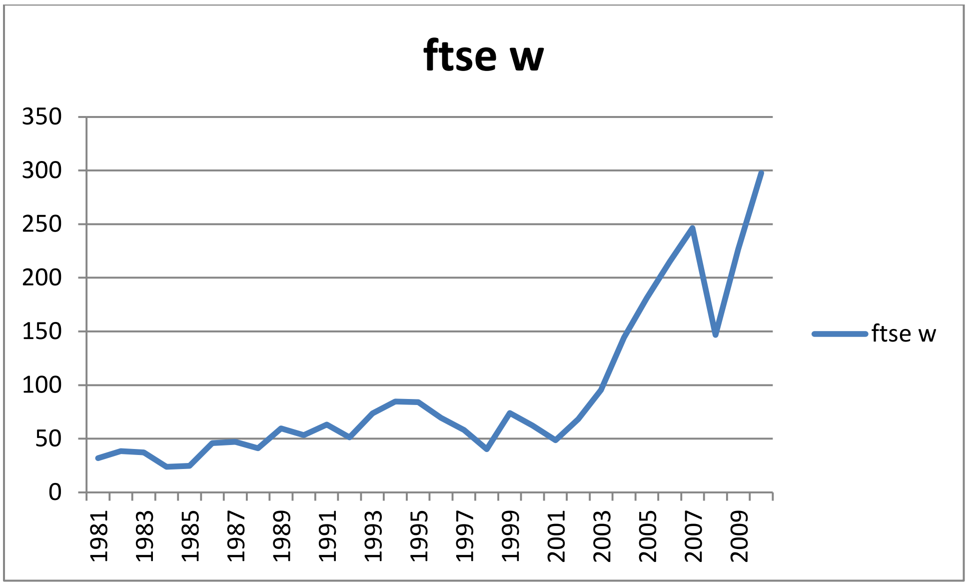

Figure 3.7 FTSE-W Index 1981-2010

When the change in stock prices in South Africa over the years is examined, the lowest level can be seen in 1984 within the range of years 1981-2011. Share prices that normally rise in that transition period showed a big jump from 2003 to 2004. This increase continued until 2007, but declined again in 2008; because it faced the world economic crisis. However, this country immediately recovered from the crisis and it reached its highest level in 2010.

Chapter 4

DATA AND METHODOLOGY

4.1 Type and Source of Data

The statistics used in this study are annual figures for the period of 1973-2010 and the variables used in the study are real gross domestic product (rGDP), real industry value added (rIND), crude oil prices (OIL) and stock price indices (SI) for Germany, Japan, Singapore, South Africa, Turkey, UK, and USA. The data for stock prices was congregated from Data Streem program (version 5.1). On the other hand, rGDP, rIND and OIL prices were gathered from website of World Bank (2012). Real GDP, real IND, and oil figures are in constant 2000 US$.

4.2 Methodology

In this study, there are three types of analysis that were employed. First of all, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were undertaken to test for unit roots of the rGDP, rIND, OIL and SI. Second, bounds tests were employed to investigate possible long-run equilibrium association among RGDP and its probable determinants such as rIND, OIL and SI. Finally, error correction models have been estimated in order to estimate short term coefficients and error corrections in addition to long term coefficients.

There are lots of studies that put emphasis on the determinants of real GDP in the countries. The current study suggests that rIND, OIL, and SI might be determinants of real GDP in the case of seven countries.

Thus, in this study the functional connection can be presented as follows:

RGDP=f (rIND, OIL, SI) (1)

Where real gross domestic product (rGDP) is a function of real industry, value added (rIND), OIL and stock price indices (SI). Since oil and stock index variables interact with real income also through the channels of industry sectors, industrial value added to the above functional relationship as advised in the literature.

The functional connection in equation (1) can be identified in logarithmic form in the subsequent model to seizure growth influences as cited earlier:

$$\text{lnr}GDP_t = \beta_0 + \beta_1 \,\text{lnr}IND_t + \beta_2 \,\text{ln}OIL_t + \beta_3 InSI_t + \varepsilon_t \quad (2)$$

Where at period t, ln rGDP is the natural logarithm of the real gross domestic product; ln rIND is the natural logarithm of the real industry value added variable; ln OIL is the natural logarithm of oil prices; ln SI is the natural logarithm of stock price indices and ε is the error term. The coefficients of β_1, β_2 and β_3 give us elasticity of rIND, OIL, SI (Katırcıoğlu, 2010).

According to Katırcıoğlu (2010), there is a presumption that the dependent variable from equation (2) might not be regulated to its long term equilibrium value by the involvement of any it's factors. Hence, the speed of adjustment for lnrGDP can be gained by evaluating the error-correction equation model which is shown below:

$$\Delta \ln rGDP_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln rGDP_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln rIND_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln OIL_{t-j} + \sum_{i=0}^{n} \beta_4 \Delta \ln SI_{t-j} + \beta_5 \, \varepsilon_{t-1} + u_t \qquad (3)$$

Where Δ attitudes for a change in lnrGDP, lnrIND, lnOIL, lnSI and ε_{t-1} is the coefficient of error correction term, which is predicted in equation (2). ECT in equation (3) demonstrates how the speed of instability situated between the short and long run values of the lnrGDP is supposed to remove each period. It is estimated that the sign of ECT is negative.

4.3 Unit Root Tests

Econometric theory proposes that variables in equation (2) are stationary. Therefore, this is known as the variables integrated of order zero as well. However, variables may be stationary at their first difference, I (1). Instead, evaluating regression models, for instance in equation (2) are not seemed to be strong as long as the variable are not stationary (Gujarati, 2003). The ADF (Augmented Dickey-Fuller) and (Phillips-Perron) tests for unit roots are employed in order to test the stationary nature of the variables (Phillips and Perron 1988; Dickey and Fuller 1981).

Furthermore, Enders (1995) points out that, the entire tests for unit roots in the case of ADF and PP tests are carried out by commencing from the most common model (which includes trend and intercept) to the most confined model (including without trend and intercept). This method enables the researchers to understand whether including trend and intercept factors will vary for the stationary habit of the variables or not.

4.4 The ARDL Approach

As a whole, the economic processes have been carried out to realize if determinants are in long-run connection and if they have an influence on another in long run. What is more, there is long-run relationship, where the determinants are stationary at their level forms; whereas, if they are stationary in their first and second differences, then their long-run correlation are presumed to be reduced and altered to short term variables. Nevertheless, there is still a probability to be in that position. Thus, further research must have been carried out to test for long term connection amongst the variables. There are many variable methods so as to estimate whether it is long-run relationship or not. With respect to, Engel and Granger (1987) and Johansen (1988) and Johansen and Juselius (1991) co-integration tests, alleged that the determinants are needed to be integrated of the same order interesting for long-run relationship. Further steps cannot be applied in the long term period when the variables are not in the same order. For this reason, it enables the researches to evaluate variables only for the short term period (Katırcıoğlu, 2009).

Instead of the alternative attitude to Engel and Granger (1987) and Johansen (1988) and Johansen and Juselius (1991) variety co-integration tests have been established by Peseran et al. (2001) in order to test long-run association among the variables. The fundamental feature of the bounds test is that the dependent variable shall be definitely integrated of order one, I(1).

In this thesis ARDL approach was used in the bounds test. So as to investigate for the long term connection among real gross domestic product, real industry value added, oil prices and stock price indices in seven countries; Germany, Japan, Singapore, South Africa, Turkey, UK, US. This ARDL method, which was established by Peseran et al. (2001), can be used when the independent variables are irrespective. The subsequent error correction model for assessing long term correlation is shown below in the ARDL model:

$$\Delta \text{lnr}GDP_t = a_{0_Y} + \sum_{i=1}^{n} b_{i_Y} \, \Delta \text{lnrG}DP_{t-i} + \sum_{i=0}^{n} c_{i_Y} \, \Delta \text{lnrIND}_{t-i} + \sum_{i=0}^{n} d_{i_Y} \, \Delta \text{lnOIL}_{t-i} + \sum_{i=0}^{n} e_{i_Y} \, \Delta \text{lnSI}_{t-i} + \sigma_{1_Y} \text{lnrG}DP_{t-1} + \sigma_{2_Y} \text{lnrIND}_{t-i} + \sigma_{3_Y} \text{lnOIL}_{t-1} + \sigma_{4_Y} \text{lnSI}_{t-i} + \varepsilon_{1_t} \tag{4}$$

In equation (4), Δ is the difference operator, lnrGDPt is the natural logarithm of dependent variable, real gross domestic product, lnrINDt, lnOILt, lnSIt are the natural logarithms of independent variables of IND, OIL and SI and ε_{1t} is error term of the model.

The F-test is employed to test the validity of equation (4); when F-test confirms the overall significance of equation (4), then the long-run link between rGDP and its elements in equation (4) as also confirmed (See Pesaran et al., 2001). In equation (4), when lnrGDP is dependent, the null hypothesis of no long term correlation is $H_0: \sigma_{1Y} = \sigma_{2Y} = \sigma_{3Y} = \sigma_{4Y} = 0$ and the alternative hypothesis of having long term connection is $H_1: \sigma_{1Y} \neq \sigma_{2Y} \neq \sigma_{3Y} \neq \sigma_{4Y} \neq 0$. According to Peseran et al. (2001) there are five different situations so as to evaluate equation (4). In this study, scenarios III, IV and V will be employed in F-test.

4.5 Error Correction Model

Once long term relationship is obtained in equation (4), long term coefficients from in equation (2) should be also estimated. Then, short term coefficients plus error correction terms are estimated. Consequently, the error correction model (ECM) for equation (2) under the ARDL method can be proposed as:

$$\Delta \ln rGDP_t = \Delta\beta_0 + \sum_{j=1}^{p-1} \Phi_j \, \Delta \ln rGDP_{t-i}$$

$$+\sum_{i=1}^{k} \beta_{i_0} \, \Delta \ln X_{it} + \sum_{i=1}^{k} \sum_{j=1}^{q-1} \beta_{ij} \, \Delta X_{i,t-j} + \varphi \Delta Z_t + \gamma(1,p) ECT_{t-1} + u_t \quad (5)$$

Where Φ_j , β_i, and φ are the coefficients for the short-run period, the coefficient of $\gamma(1,p)$ shows error correction term which is estimated to be negative. Lastly, X variable in equation (5) views for independent variables, lnrIND, lnOIL and lnSI in this study.

Chapter 5

EMPIRICAL RESULTS

5.1 Unit Root for Stationary

In this section, we are going to analyze the stationary nature of our variables under the ADF and PP approaches for unit roots. These will be examined individually for each country.

Table 1. ADF and PP Tests for Unit Root (Germany)

Statistics (Level)	ln OİL	Lag	ln RGDP	Lag	ln RİND	lag	In SI	Lag
τ_T (ADF)	-3.022	(0)	-1.437	(0)	-3.196	(0)	-2.764	(0)
τ_μ (ADF)	-3.161**	(0)	-1.581**	(0)	-1.529	(0)	-0.986	(0)
τ (ADF)	0.796	(0)	5.402	(0)	0.806	(0)	2.112	(0)
τ_T (PP)	-3.128	(3)	-1.060	(7)	-3.090	(4)	-2.764	(0)
τ_μ (PP)	-3.195**	(3)	-2.825***	(14)	-1.285	(7)	-0.951	(3)
τ (PP)	0.796	(0)	6.281	(6)	1.802	(13)	2.444	(3)
Statistics (First Difference)	Δ ln OİL	Lag	Δln RGDP	Lag	Δln RİND	lag	In SI	Lag
τ_T (ADF)	-7.234*	(0)	-5.335	(0)	-6.058*	(0)	-6.233*	(0)
τ_μ (ADF)	-7.464*	(0)	-5.089*	(0)	-6.107*	(0)	-6.306*	(0)
τ (ADF)	-7.445*	(0)	-3.164*	(0)	-6.066*	(0)	-5.602*	(0)
τ_T (PP)	-7.243*	(1)	-7.354*	(16)	-7.962*	(11)	-6.347*	(4)
τ_μ (PP)	-7.468*	(1)	-5.011*	(7)	-7.349*	(10)	-6.430*	(4)
τ (PP)	-7.457*	(1)	-3.090*	(1)	-6.206*	(6)	-5.596*	(2)

Table 1 presents unit root test results for Germany for the period 1973-2010. Oil and rGDP seem to be non-stationary both in ADF and PP tests when intercept and trend are included. But when trend is omitted and intercept is included, then, oil and rGDP become stationary; this is because the null hypothesis of a unit root can be rejected at alpha=0.05 for oil in ADF and PP tests and also for rGDP in ADF test. In PP test, the null hypothesis can be rejected at alpha=0.10 for rGDP. Since trend is observed in real income of Germany when plotted, it is clearly seen that trend should not be eliminated from unit root tests. Therefore, real GDP of Germany in fact is non-stationary (See Enders, 1995). Secondly, rIND and SI, on the other hand, seem to be all non-stationary in all of three scenarios of ADF and PP tests, this is because, the null hypothesis of a unit root cannot be rejected in the case of rIND and SI of Germany. But, they become stationary at first differences, their first difference is stationary. To summarize, oil prices in Germany are integrated of order zero, I(0), while real GDP, real industrial value added and stock index are integrated of order one, I(1), in the case of Germany.

Table 2. ADF and PP Tests for Unit Root (Japan)

Statistics (Level)	ln OİL	Lag	ln RGDP	Lag	ln RİND	Lag	In SI	Lag
τ_T (ADF)	-2.107	(0)	0.180	(0)	-1.190	(0)	-1.834	(1)
τ_μ (ADF)	-2.015	(0)	-3.122**	(0)	-1.522	(0)	-2.375	(1)
τ (ADF)	0.892	(0)	2.740	(1)	1.942	(0)	0.949	(0)
τ_T (PP)	-2.290	(3)	0.058	(1)	-1.184	(1)	-1.322	(3)
τ_μ (PP)	-2.164	(3)	-2.767***	(2)	-1.522	(0)	-1.861	(3)
τ (PP)	0.971	(1)	3.705	(4)	1.951	(1)	0.949	(0)

Statistics (First Difference)	Δ ln OİL	Lag	Δln RGDP	Lag	Δln RİND	Lag	In SI	Lag
τ_T (ADF)	-7.556*	(0)	-5.094*	(0)	-5.842*	(0)	-4.915*	(0)
τ_μ (ADF)	-7.639*	(0)	-3.647*	(0)	-5.517*	(0)	-4.639*	(0)
τ (ADF)	-7.619*	(0)	-1.119	(2)	-4.942*	(0)	-4.471*	(0)
τ_T (PP)	-7.556*	(0)	-5.075*	(2)	-5.826*	(1)	-4.853*	(6)
τ_μ (PP)	-7.631*	(1)	-3.661*	(2)	-5.512*	(1)	-4.623*	(3)
τ (PP)	-7.587*	(2)	-2.003**	(2)	-5.053*	(3)	-4.486*	(1)

Table 2 presents unit root test results for Japan for the period 1973-2010. Real GDP seem to be non-stationary both in ADF and PP tests when intercept and trend are included. But when trend is omitted and intercept is included, then, rGDP become stationary; this is because the null hypothesis of a unit root can be rejected at alpha=0.05 in ADF test, in PP test the null hypothesis of a unit root can be rejected at alpha=0.10. Since again trend is observed in real income of Japan when plotted, it is seen that trend should not be eliminated from unit root tests. Therefore, real GDP of Japan is also non-stationary (See Enders, 1995). Secondly, oil, rIND and SI, on the other hand, seem to be all non-stationary in all of three scenarios of ADF and PP tests, this is because, the null hypothesis of a unit root cannot be rejected in the case of oil, rIND and SI of Japan. But, they become stationary at first differences, their first difference is stationary. To summarize, all of the variables in the case of Japan including real GDP is integrated of order one, I(1).

Table 3. ADF and PP Tests for Unit Root (Singapore)

Statistics (Level)	ln OİL	lag	ln RGDP	Lag	ln RİND	lag	In SI	Lag
τ_T (ADF)	-2.521	(0)	-1.467	(0)	-2.700	(0)	-7.080*	(0)
τ_μ (ADF)	-2.579	(0)	-1.095	(0)	-0.819	(0)	-1.749	(2)
τ (ADF)	0.819	(0)	10.875	(0)	6.385	(0)	0.619	(2)
τ_T (PP)	-2.707	(3)	-1.592	(1)	-2.706	(3)	-7.037*	(4)
τ_μ (PP)	-2.719***	(3)	-1.113	(2)	-1.115	(10)	-5.893*	(4)
τ (PP)	0.877	(1)	10.176	(1)	8.025	(7)	0.221	(6)
Statistics (First Difference)	Δ ln OİL	lag	Δln RGDP	Lag	Δln RİND	lag	In SI	Lag
τ_T (ADF)	-7.380*	(0)	-4.856*	(0)	-4.870*	(0)	-11.230*	(1)
τ_μ (ADF)	-7.559*	(0)	-4.829*	(0)	-5.019*	(0)	-11.409*	(1)
τ (ADF)	-7.557*	(0)	-0.727	(2)	-2.574**	(0)	-11.461*	(1)
τ_T (PP)	-7.423*	(1)	-4.712*	(3)	-4.627*	(10)	-15.632*	(4)
τ_μ (PP)	-7.584*	(1)	-4.848*	(1)	-4.872*	(9)	-15.915*	(4)
τ (PP)	-7.578*	(2)	-1.454	(1)	-2.574**	(0)	-15.767*	(4)

Table 3 presents unit root test results for Singapore for the period 1973-2010. Oil seems to be non-stationary both in ADF and PP tests when intercept and trend are included. But when trend is omitted and intercept is included, then, oil become stationary; this is because the null hypothesis of a unit root can be rejected at alpha=0.10 in PP test. Secondly, SI seems stationary in ADF and PP tests when intercept and trend are included. The null hypothesis of a unit root can be rejected at alpha=0.01. Thirdly, rIND and rGDP, on the other hand, seem to be all non-stationary in all of three scenarios of ADF and PP tests, this is because, the null hypothesis of a unit root cannot be rejected in the case of rIND and rGDP of Singapore. But, they become stationary at first differences, their first difference is stationary. To summarize, oil prices and stock index are integrated of order zero, I(0), while real industrial value added and real GDP are integrated of order one, I(1), in the case of Singapore.

Table 4. ADF and PP Tests for Unit Root (South Africa)

Statistics (Level)	ln OİL	Lag	ln RGDP	lag	ln RİND	Lag	In SI	Lag
τ_T (ADF)	-1.523	(0)	-1.161	(1)	-1.779	(0)	-1.996	(2)
τ_μ (ADF)	-2.757***	(0)	-0.696	(1)	0.591	(0)	-2.336	(2)
τ (ADF)	-1.700***	(0)	0.515	(1)	1.891	(0)	-0.794	(0)
τ_T (PP)	-1.393	(6)	-1.101	(3)	-1.683	(7)	-1.700	(2)
τ_μ (PP)	-2.757***	(0)	-0.868	(3)	0.841	(6)	-2.153	(1)
τ (PP)	-1.655***	(3)	0.252	(3)	1.902	(3)	-0.794	(0)

Statistics (First Difference)	Δ ln OİL	Lag	Δln RGDP	lag	Δln RİND	Lag	In SI	Lag
τ_T (ADF)	-4.419*	(1)	-3.399***	(3)	-4.781*	(0)	-0.359	(1)
τ_μ (ADF)	-5.221*	(0)	-3.139**	(0)	-4.590*	(0)	-0.522	(1)
τ (ADF)	-5.107*	(0)	-3.159*	(0)	-4.059*	(0)	-2.843*	(0)
τ_T (PP)	-8.658*	(13)	-3.839**	(7)	-7.391*	(22)	-2.538	(0)
τ_μ (PP)	-5.248*	(3)	-3.139**	(0)	-4.545*	(6)	-2.637***	(0)
τ (PP)	-5.137*	(3)	-3.159*	(0)	-4.059*	(0)	-2.843*	(0)

Table 4 present unit root test results for South Africa for the period 1981-2010. Oil seems to be non-stationary both in ADF and PP tests when intercept and trend are included. But when trend is omitted and intercept is included, then, oil become stationary; this is because the null hypothesis of a unit root can be rejected at alpha=0.10 in ADF and PP tests. Secondly, rGDP, rIND and SI, on the other hand, seem to be all non-stationary in all of three scenarios of ADF and PP tests, this is because, the null hypothesis of a unit root cannot be rejected in the case of rGDP, rIND and SI of South Africa. But, they become stationary at first differences, their first difference is stationary. To summarize, oil prices is integrated of order zero, I(0), while real GDP, real industrial value added and stock index are integrated of order one, I(1), in the case of South Africa.

Table 5. ADF and PP Tests for Unit Root (Turkey)

Statistics (Level)	ln OİL	lag	ln RGDP	lag	ln RİND	Lag	In SI	Lag
τ_T (ADF)	0.102	(0)	-2.665	(0)	-2.509	(0)	-5.003*	(0)
τ_μ (ADF)	-3.028**	(0)	-0.501	(0)	-0.789	(0)	-3.098**	(0)
τ (ADF)	-5.261*	(0)	2.157	(0)	3.082	(0)	0.850	(1)
τ_T (PP)	0.102	(0)	-2.696	(1)	-2.578	(1)	-5.003*	(0)
τ_μ (PP)	-2.655***	(2)	-0.501	(0)	-0.789	(0)	-36.117**	(2)
τ (PP)	-4.349*	(2)	2.434	(1)	3.082	(0)	1.797	(5)

Statistics (First Difference)	Δ ln OİL	lag	Δln RGDP	lag	Δln RİND	Lag	In SI	Lag
τ_T (ADF)	-3.804**	(0)	-5.246*	(0)	-4.459**	(0)	-4.418**	(4)
τ_μ (ADF)	-2.422	(0)	-5.388*	(0)	-4.584*	(0)	-4.159*	(4)
τ (ADF)	-1.958**	(0)	-4.291*	(0)	-3.289*	(0)	-7.394*	(0)
τ_T (PP)	-3.763**	(4)	-5.246	(0)	-4.459**	(0)	-17.891*	(14)
τ_μ (PP)	-2.422	(0)	-5.388*	(0)	-4.584*	(0)	-14.959*	(12)
τ (PP)	-1.840***	(4)	-4.345*	(2)	-3.307*	(2)	-9.529*	(7)

Table 5 presents unit root test results for Turkey for the period 1988-2010. Oil seems to be non-stationary both in ADF and PP tests when intercept and trend are included. But when trend is omitted and intercept is included, then, oil become stationary; this is because the null hypothesis of a unit root can be rejected at alpha=0.05 in ADF test, in PP test the null hypothesis of a unit root can be rejected at alpha=0.10. Secondly, SI seems stationary in ADF and PP tests when intercept and trend are included. The null hypothesis of a unit root can be rejected at alpha=0.01. Secondly, rGDP and rIND, on the other hand, seem to be all non-stationary in all of three scenarios of ADF and PP tests, this is because, the null hypothesis of a unit root cannot be rejected in the case of rGDP, rIND of Turkey. But, they become stationary at first differences, their first difference is stationary. To summarize, oil prices and stock index are integrated of order zero, I(0), while real GDP and real industry value added are integrated of order one, I(1), in the case of Turkey.

Table 6. ADF and PP Tests for Unit Root (UK)

Statistics (Level)	ln OİL	lag	ln RGDP	lag	ln RİND	lag	In SI	Lag
τ_T (ADF)	-1.298	(0)	-3.777**	(1)	-0.599	(0)	-1.738	(0)
τ_μ (ADF)	-1.329	(0)	-0.467	(1)	-1.415	(0)	-1.778	(0)
τ (ADF)	0.414	(0)	2.194	(1)	1.217	(0)	1.746	(0)
τ_T (PP)	-1.330	(2)	-2.083	(2)	-0.903	(1)	-1.719	(1)
τ_μ (PP)	-1.477	(3)	-0.435	(2)	-1.425	(1)	-2.080	(5)
τ (PP)	0.462	(1)	4.399	(2)	1.217	(0)	1.939	(3)

Statistics (First Difference)	Δ ln OİL	lag	Δln RGDP	lag	Δln RİND	lag	In SI	Lag
τ_T (ADF)	-6.653*	(0)	-3.089	(0)	-4.198**	(0)	-5.749*	(4)
τ_μ (ADF)	-6.498*	(0)	-3.142**	(0)	-4.189*	(0)	-5.910*	(0)
τ (ADF)	-6.603*	(0)	-2.111**	(0)	-4.134*	(0)	-5395*	(0)
τ_T (PP)	-6.880*	(3)	-3.112	(2)	-4.100**	(4)	-8.329*	(7)
τ_μ (PP)	-6.512*	(1)	-3.170**	(2)	-4.181*	(3)	-5.943*	(3)
τ (PP)	-6.621*	(1)	-2.159**	(1)	-4.191*	(1)	-5.395*	(2)

Table 6 presents unit root test results for UK for the period 1978-2010. Real GDP seem to be Stationary; this is because the null hypothesis of a unit root can be rejected at alpha=0.05 in ADF test when intercept and trend are included. But, this is not confirmed by the PP test. It is advised that the PP test is superior to the ADF test due to autocorrelation problems (Enders, 1995). Therefore, finding from the PP test will be taken into consideration in this thesis. Secondly, Oil, rIND and SI, on the other hand, seem to be all non-stationary in all of three scenarios of ADF and PP tests, this is because, the null hypothesis of a unit root cannot be rejected in the case of oil, rIND and SI of UK. But, they become stationary at first differences, their first difference is stationary. To summarize, all of the variables in the case of the UK including real GDP is integrated of order one, I(1).

Table 7. ADF and PP Tests for Unit Root (US)

Statistics (Level)	ln OİL	Lag	ln RGDP	Lag	ln RİND	lag	In SI	Lag
τ_T (ADF)	-2.364	(0)	-2.640	(1)	-3.238***	(1)	-2.402	(0)
τ_μ (ADF)	-2.364	(0)	-0.911	(0)	-0.440	(0)	-0.751	(0)
τ (ADF)	0.548	(0)	3.581	(1)	2.515	(2)	2.370	(0)
τ_T (PP)	-2.578	(3)	-1.719	(1)	-2.689	(2)	-2.470	(2)
τ_μ (PP)	-2.569	(3)	-0.894	(4)	-0.454	(4)	-0.700	(3)
τ (PP)	0.548	(0)	6.478	(3)	1.903	(4)	2.939	(3)

Statistics (First Difference)	Δ ln OİL	Lag	Δln RGDP	Lag	Δln RİND	lag	In SI	Lag
τ_T (ADF)	-7.867*	(0)	-4.456*	(1)	-5.143*	(1)	-3.347***	(5)
τ_μ (ADF)	-8.000*	(0)	-4.223*	(1)	-5.219*	(1)	-7.593*	(0)
τ (ADF)	-8.108*	(0)	-2.253**	(0)	-4.043*	(0)	-1.134	(5)
τ_T (PP)	-7.867*	(0)	-4.495*	(6)	-4.172**	(8)	-9.399*	(6)
τ_μ (PP)	-8.027*	(1)	-4.345*	(4)	-4.269*	(8)	-7.775*	(3)
τ (PP)	-8.130*	(2)	-2.253**	(0)	-3.970*	(3)	-6.053*	(3)

Table 7 presents unit root test results for US for the period 1973-2010. Real IND seem to be Stationary; this is because the null hypothesis of a unit root can be rejected at alpha=0.10 in ADF test when intercept and trend are included. This is again not confirmed by the PP test. Secondly, oil, rGDP and SI, on the other hand, seem to be all non-stationary in all of three scenarios of ADF and PP tests, this is because, the null hypothesis of a unit root cannot be rejected in the case of oil, rGDP and SI of US. But, they become stationary at first differences, their first difference is stationary. To summarize, all of the variables in the case of the USA including real industry value added is integrated of order one, I(1).

Tables 1 through 7 reports the ADF and, the PP test results for stationary in the series selected. The results have provided mixed results between ADF and the PP tests in several variables. In other words, the test results from the PP tests further confirm the ADF test indicating all data series are integrated of order one except RGDP in Germany, Japan and the UK, SI in Singapore and Turkey, OIL in South Africa, Singapore, Germany and Turkey, and RIND in the US. The inspection of the relevant variables confirms the view that the other variables in question are all non-stationary in levels but stationary in first differences. It is worth emphasizing that final decision on the stationary nature of the variables under consideration has been given based on the PP tests as advised in the relevant literature (Katircioglu, 2009; Enders, 1995). Furthermore, it is very essential to note again that, further analyses including the ARDL estimations for level relationships and error correction models should be carried out for those models whose dependent variables are integrated of order one, I (1) (see Pesaran et al 2001). When our results are checked, it is seen that we have already satisfied this condition.

5.2 Bounds Test for Long Run Relationship

Unit root tests results indicate that findings provide mixed evidence of the order of integration for co-integration tests ahead. Therefore, classical co-integration approaches such as Engel and Granger (1979) and Johansen (1990) as well as Johansen and Juselius (1991) cointegration tests cannot be adopted in this case. We must then turn to conduct bounds test for a level relationship suggested by Pesaran et al. (2001). The critical value bounds for this test are estimated by Pesaran et al. (1996a) and are summarized as "a, b, and c" in columns F_{III}, F_{IV} and F_V of Tables 8 through 15. Columns F_{III}, F_{IV} and F_V give computed F-statistics for each model across the countries. Three scenarios have been used in this thesis in order to test for long term relationship as formulated in equation (4) and as proposed by Pesaran et al. (2001): F_{IV} stands for the F statistic of the model with unrestricted intercept and restricted trend, F_V stands for the F statistic of the model with unrestricted intercept and trend, and F_{III} stands for the F statistic of the model with unrestricted intercept and no trend.

In Tables 8 through 15 if F-statistics exceeds the upper bound of critical value band, we reject the null of $H_0\colon \sigma_{1Y} = \sigma_{2Y} = \sigma_{3Y} = \sigma_{4Y} = 0$ (no long run relationship between the variables in the model used in this thesis). The evidence suggests that there is a long run relationship in the model whereas real GDP is dependent, real industry value added (rIND), stock indices (SI) and oil prices (oil) are independent variables. Results suggest that there is a long run relationship in the relevant model for Germany, Japan, Singapore, and South Africa. However, the model provides a long run relationship for Turkey without stock indices (SI) and real industry value added (rIND). In the case of the USA and the UK, we did not obtain any long run relationship. This is stage one which is a necessary step to check whether there is a long run relationship between the variables under investigation which is tested by computing F-statistics for the significance of the lagged levels of the variables in the error correction form of the underlying ARDL model. The F-statistics confirms that there is a co-integrating relationship based on the model under inspection. In the next step tables of bounds tests and their detailed interpretations are provided.

Table 8. The Bounds Test for Level Relationships (Germany)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnRIND, lnOİL lnSI)						H_0 Rejected
p = 1	9.038c	7.224b	-3.077a	11.539c	-5.833c	
2	3.740a	4.103a	-3.469c	4.878a	-4.069c	
3	1.656a	1.494a	-2.394a	2.173a	-2.508a	
4	2.173a	2.711a	-2.189a	2.450a	-2.453a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

Table 8 gives bounds test results for Germany. It is seen that the null hypothesis of no level relationship can be rejected according to the F_{IV} (at lag1) and F_{III} (at lag1) scenarios. This is because computed F values are higher than upper critical values. On the other hand, the null hypothesis of no level relationship can neither be rejected nor accepted in F_V scenario; test is inconclusive in this case since F-value falls between lower and upper critical values. To summarize, results of bounds tests confirm the existence of long term relationship between RGDP and its regressors (RIND, SI and OİL) in the case of Germany according to the F_{III} and F_{IV} scenarios.

On the other hand, application of t-test shows that deterministic trend restrictions will be needed in estimating all of the ARDL models since there are significant t ratios in F_V and F_{III} scenarios (please see Peseran et al., 2001).

Table 9. The Bounds Test for Level Relationships (Japan)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnRIND, lnOİL lnSI)						H_0 Rejected
p = 1	13.961c	3.007a	2.130a	13.401c	-0.574a	
2	3.491a	1.247a	1.190a	3.869a	-0.012a	
3	1.364a	0.308a	0.145a	1.773a	-0.408a	
4	2.032a	0.321a	0.921a	2.204a	-0.316a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

Table 9 gives bounds test results for Japan. It is seen that the null hypothesis of no level relationship can be rejected according to the F_{IV} (at lag1) and F_{III} (at lag1) scenarios. This is because computed F values are higher than upper critical values. On the other hand, the null hypothesis of no level relationship cannot be rejected in F_V scenario. This is because computed F values are below than lower critical values. To summarize, results of bounds tests confirm the existence of long term relationship between RGDP and its regressors (RIND, SI and OİL) in the case of Japan according to the F_{IV} and F_{III} scenarios.

On the other hand, application of t-test shows that deterministic trend restrictions will not be needed in estimating all of the ARDL models since there are not significant t ratios in F_V and F_{III} scenarios (See Pesaran et al., 2001).

Table 10. The Bounds Test for Level Relationships (Singapore)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnRIND, lnOİL lnSI)						H_0 Rejected
p = 1	5.515c	5.354a	-2.853a	3.198a	-0.191a	
2	2.157a	2.049a	-2.240a	0.821a	0.017a	
3	1.155a	1.466a	-1.518a	0.749a	0.533a	
4	2.029a	2.162a	-2.415a	0.295a	0.235a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

Table 10 gives bounds test results for Singapore. It is seen that the null hypothesis of no level relationship can be rejected according to the F_{IV} (at lag1) scenario. This is because computed F value is higher than upper critical value. On the other hand, the null hypothesis of no level relationship cannot be rejected in F_V and F_{III} scenarios. This is because computed F values are lower than critical values. To summarize, results of bounds tests confirm the existence of long term relationship between RGDP and its regressors (RIND, SI and OİL) in the case of Singapore according to the F_{IV} scenario.

On the other hand, application of t-test shows that deterministic trend restrictions will not be needed in estimating all of the ARDL models since there are not significant t ratios in F_V and F_{III} scenarios (please see Pesaran et al., 2001).

Table 11. The Bounds Test for Level Relationships (South Africa)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnRIND, lnOİL lnSI)						H_0 Rejected
p = 1	8.138c	1.322a	-0.741a	9.028c	-0.116a	
2	4.375a	1.353a	-0.659a	7.119c	-0.011a	
3	2.825a	0.642a	-0.238a	3.563a	-0.844a	
4	16.680c	0.996a	-1.435a	22.879c	-4.134a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

Table 11 gives bounds test results for South Africa. It is seen that the null hypothesis of no level relationship can be rejected according to the F_{IV} (at lag1 and 4) and F_{III} (at lag1, 2 and 4) scenarios. This is because computed F values are higher than upper critical values. On the other hand, the null hypothesis of no level relationship cannot be rejected in F_V scenario. This is because computed F values are lower than critical values. To summarize, results of bounds tests confirm the existence of long term relationship between RGDP and its regressors (RIND, SI and OİL) in the case of South Africa according to the F_{IV} and F_{III} scenarios.

On the other hand, application of t-test shows that deterministic trend restrictions will not be needed in estimating all of the ARDL models since there are not significant t ratios in F_V and F_{III} scenarios (please see Peseran et al., 2001).

Table 12. The Bounds Test for Level Relationships (Turkey)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnRIND, lnOİL)						H_0 Rejected
p = 1	7.671c	9.346c	-5.091c	10.688c	-5.216c	
2	2.522a	3.238a	-2.423a	3.108a	-2.269a	
3	2.588a	2.855a	-1.652a	3.020a	-1.462a	
4	1.684a	2.159a	-0.958a	1.951a	-0.394a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

Two models have been tested in the case of Turkey. Table 12 gives bounds test results for Turkey where regressors are industry and oil prices. It is seen that the null hypothesis of no level relationship can be rejected according to the F_{IV} (at lag1), F_V (at lag1) and F_{III} (at lag1) scenarios. This is because computed F values are higher than upper critical values. To summarize, results of bounds tests confirm the existence of long term relationship between RGDP and its regressors (RIND and OİL) in the case of Turkey according to the F_{IV}, F_V and F_{III} scenarios.

On the other hand, application of t-test shows that deterministic trend restrictions will be needed in estimating all of the ARDL models since there are significant t ratios in F_V and F_{III} scenarios (See Pesaran et al., 2001).

Table 13. The Bounds Test for Level Relationships (Turkey)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnOİL, lnSI)						H_0 Accepted
p = 1	2.336a	2.543a	-2.716a	1.945a	-2.096a	
2	1.144a	1.447a	-0.944a	1.098a	-0.057a	
3	2.254a	2.010a	-1.752a	1.587a	-0.186a	
4	0.837a	0.856a	-0.565a	1.223a	-0.113a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

On the other hand, Table 13 gives bounds test results for Turkey where regressors are oil prices and stock market index. It is seen that the null hypothesis of no level relationship cannot be rejected according to the F_{IV}, F_V and F_{III} scenarios. This is because computed F values are lower than critical values. To summarize, results of bounds tests disapprove the existence of long term relationship between RGDP and its regressors (OİL and SI) in the case of Turkey.

Application of t-test shows that deterministic trend restrictions will not be needed in estimating all of the ARDL models since there are not significant t ratios in F_V and F_{III} scenarios (See Pesaran et al., 2001).

Table 14. The Bounds Test for Level Relationships (UK)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnRIND, lnOİL lnSI)						H_0 Accepted
p = 1	2.426a	1.784a	0.274a	2.866a	-1.162a	
2	1.215a	1.141a	-0.125a	1.569a	0.256a	
3	1.181a	1.458a	-0.548a	1.323a	0.213a	
4	3.068a	3.768a	-0.133a	4.292a	-0.505a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

Table 14 gives bounds test results for UK. It is seen that the null hypothesis of no level relationship can be accepted according to the F_{IV}, F_V and F_{III} scenarios. This is because computed F values are lower than critical values. To summarize, results of bounds tests disapprove the existence of long term relationship between RGDP and its regressors (RIND, OİL and SI) in the case of UK according to the $F_{IV,}$ F_V and F_{III} scenarios.

On the other hand, application of t-test shows that deterministic trend restrictions will not be needed in estimating all of the ARDL models since there are not significant t ratios in F_V and F_{III} scenarios (See Pesaran et al., 2001).

Table 15. The Bounds Test for Level Relationships (US)

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_{V}	t_{V}	F_{III}	t_{III}	Conclusion
F_y (lnRGDP / lnRIND, lnOİL lnSI)						H_0 Accepted
p = 1	3.040a	2.418a	-1.191a	3.926a	-3.375a	
2	2.397a	1.239a	-1.217a	3.095a	-2.289a	
3	2.366a	1.025a	-0.835a	3.113a	-2.268a	
4	1.884a	1.356a	-1.046a	2.535a	-2.503a	

Note: a denotes that computed value falls below lower limit of critical values; b denotes that computed value falls within the lower and upper of critical values; c denotes that computed value falls above the upper limit of critical values.

Table15 gives bounds test results for US. It is seen that the null hypothesis of no level relationship can be accepted according to the F_{IV}, F_{V} and F_{III} scenarios. This because computed F values are below than lower critical values. To summarize, results of bounds tests disapprove the existence of long term relationship between RGDP and its regressors (RIND, OİL and SI) in the case of US according to the F_{IV}, F_{V} and F_{III} scenarios.

On the other hand, application of t-test shows that deterministic trend restrictions will not be needed in estimating all of the ARDL models since there are not significant t ratios in F_{V} and F_{III} scenarios (See Pesaran et al., 2001).

5.3 The ARDL and Error Correction Models

Several methods are available for conducting the co-integration test. The most commonly conducted methods include the residual based Engle-Granger (1987) test, the maximum likelihood based Johansen (1988) and Johansen Juselius (1990) tests. Due to the low power and other problems associated with these methods, the OLS based autoregressive distributed lag (ARDL) approach to co-integration has become popular in recent years. The main advantage of ARDL modeling lies in the fact that it can be applied irrespectively of whether the regressors are I(0) or I(1). This explains that the estimation strategy causes to avoid the problems associated with standard co-integration analysis which requires the classification of the variables into I(0) and I(1).

The other advantage of the approach is that the model takes sufficient numbers of lags to capture the data generating process in general to specific modelling framework. This also gives us a chance to drive a dynamic error correction model from ARDL. The ARDL approach keeps the long-run information and avoids problems resulting from non-stationary time series data (Laurenceson and Chai, 2003).

In stage two, we estimate the coefficients of the long run relationships and find their error correction mechanism. Tables 16 through 24 indicate that long-run estimates as well as short-run estimates. Tables 16 through 24 report long run coefficients and the short run dynamics with the error correction terms (coefficients) of the relevant model.

Table 16. The ARDL Error Correction Model for RGDP (Germany)

Regressor	Coefficient	Standard Error	p-value
$\Delta lnrgdp_{t-1}$	0.1559	0.0445	0.0081
$\Delta lnrgdp_{t-2}$	0.3015	0.0470	0.0002
$\Delta lnrgdp_{t-3}$	0.1113	0.0474	0.0469
$\Delta lnrgdp_{t-4}$	-0.3637	0.0422	0.0000
$\Delta lnoil$	-0.0084	0.0010	0.0000
$\Delta lnoil_{t-1}$	-0.0407	0.0027	0.0000
$\Delta lnoil_{t-2}$	-0.0285	0.0028	0.0000
$\Delta lnoil_{t-3}$	-0.0121	0.0016	0.0001
$\Delta lnoil_{t-4}$	-0.0101	0.0011	0.0000
$\Delta lnoil_{t-5}$	-0.0068	0.0009	0.0001
$\Delta lnrind$	0.4918	0.0078	0.0000
$\Delta lnrind_{t-1}$	-0.3318	0.0252	0.0000
$\Delta lnrind_{t-2}$	-0.4416	0.0319	0.0000
$\Delta lnrind_{t-3}$	-0.3537	0.0330	0.0000
$\Delta lnrind_{t-4}$	-0.0809	0.0203	0.0041
$\Delta lnrind_{t-5}$	-0.0505	0.0161	0.0141
$\Delta lnsi$	0.0086	0.0010	0.0000
$\Delta lnsi_{t-1}$	-0.0879	0.0062	0.0000
$\Delta lnsi_{t-2}$	-0.0660	0.0053	0.0000
$\Delta lnsi_{t-3}$	-0.0415	0.0039	0.0000
$\Delta lnsi_{t-4}$	-0.0368	0.0024	0.0000
$\Delta lnsi_{t-5}$	-0.0130	0.0026	0.0013
C	-0.0038	0.0007	0.0006
$ECMT_{t-1}$	-0.8559	0.0538	0.0000

Adj. R^2= 0.997925,
S.E. of Regr. = 0.000867,
AIC = -11.14928, SBC = -10.04998,
F-stat. = 649.2529, F-prob. = 0.000,
D-W stat. = 2.879102

Table 17. Level Equation with Constant and Trend (Germany)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGOİL	0.0342	0.0048	7.1209	0.0000
LOGRIND	0.9627	0.0414	23.2437	0.0000
LOGSİ	0.1319	0.0092	14.2808	0.0000
C	-16.9812	1.1374	-14.9287	0.0000

In the short run, Table 16 illustrates the results of error correction model for short run coefficients and speed of adjustment. All variables in the case of Germany are found statistically significant at and error correction term is -0.8559 which is statistically significant and negative as expected. This means that real GDP converges to its long run equilibrium level at 85.59 per cent by contribution of real industry value added (rIND), stock indices (SI) and oil prices (oil). This model shows that there is no problem in terms of R2 scores, F-value as well as Durbin-watson statistic (i.e autocorrelation problem). (At lag 0, if oil prices increase by 1%, GDP will decrease by 0.0084%. At lag 1, if oil prices increase by 1%, GDP will decrease by 0.0407%. At lag 2, if oil prices increase by 1%, GDP will decrease by 0.0285%. At lag 3, if oil prices increase by 1%, GDP will decrease by 0.0121%. At lag 4, if oil prices increase by 1%, GDP will decrease by 0.0101%. At lag 5, if oil prices increase by 1%, GDP will decrease by 0.0068%. At lag 0, if rIND increases by 1%, GDP will increase by 0.4918%. At lag 1, if rIND increases by 1%, GDP will decrease by 0.3318%. At lag 2, if rIND increases by 1%, GDP will decrease by 0.4416%. At lag 3, if rIND increases by 1%, GDP will decrease by 0.3537%. At lag 4, if rIND increases by 1%, GDP will decrease by 0.0809%. At lag 5, if rIND increases by 1%, GDP will decrease by 0.0505%. At lag 0, if SI increases by 1%, GDP will increase by 0.0086%. At lag 1, if SI increases by 1%, GDP will decrease by 0.0879%. At lag 2, if SI increases by 1%, GDP will reduce by 0.0660%. At lag 3, if SI increases by 1%, GDP will decrease by 0.0415%. At lag 4, if SI increases by 1%, GDP will decrease by 0.0368%. At lag 5, if SI increases by 1%, GDP will decrease by 0.0130%). In the case of Germany, long-run coefficients are statistically significant. This means that real industry value added (rIND), stock indices (SI) and oil prices (oil) have positive impact on real GDP. In the long-run, as can be seen from table 17, if oil prices increase by 1%, GDP will increase by 0.0342%. If rIND increases by 1%, GDP will increase by 0.9627%. If SI increases by 1%, GDP will increase by 0.1319%.

Table 18. The ARDL Error Correction Model for RGDP (Japan)

Regressor	Coefficient	Standard Error	p-value
$\Delta lnrgdp_{t-1}$	0.0736	0.0492	0.1456
$\Delta lnoil$	-0.0044	0.0045	0.3359
$\Delta lnrind$	0.3189	0.0293	0.0000
$\Delta lnsi$	-0.0043	0.0044	0.3426
C	-0.0010	0.0020	0.6222
$ECMT_{t-1}$	0.1002	0.0132	0.0000

Adj. R^2= 0.943595,
S.E. of Regr. = 0.005879,
AIC = -7.283810, SBC = -7.191695,
F-stat. = 118.1021, F-prob. = 0.000,
D-W stat. = 1.840837

Table 19. Level Equation with Constant and Trend (Japan)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGOİL	-0.0217	0.0317	-0.6864	0.4971
LOGRIND	1.5301	0.6479	2.3616	0.0241
LOGSİ	-0.1128	0.1013	-1.1139	0.2731
C	-13.5735	17.7575	-0.7643	0.4499

To evaluate the same results (Table 18 and 19) for Japan in the long run, the evidence shows that real industry value added is the only variable being statistically significant so there is a real industry value added impact on Real GDP whereas the same variable is statistically significant in the short run period. In short-run, if rIND increases by 1%, GDP will increase by 0.3189%. In long-run, if rIND increases by 1%, GDP will increase by 1.5301%. However error correction term does not work since it is positive. This suggests that income does not converge to its long term level through its regressors in the case of Japan. But, the model shows that there is no problem in terms of R2 scores, F-value as well as Durbin-Watson statistic (i.e autocorrelation problem).

Table 20. The ARDL Error Correction Model for RGDP (Singapore)

Regressor	Coefficient	Standard Error	p-value
$\Delta lnrgdp_{t-1}$	0.9123	0.1432	0.0001
$\Delta lnrgdp_{t-2}$	-0.1438	0.1465	0.3493
$\Delta lnrgdp_{t-3}$	0.0601	0.1334	0.6617
$\Delta lnrgdp_{t-4}$	1.0260	0.1674	0.0001
$\Delta lnoil$	0.0620	0.0124	0.0005
$\Delta lnoil_{t-1}$	0.0004	0.0073	0.9500
$\Delta lnoil_{t-2}$	-0.0080	0.0070	0.2772
$\Delta lnoil_{t-3}$	-0.0201	0.0068	0.0150
$\Delta lnoil_{t-4}$	-0.0358	0.0071	0.0005
$\Delta lnrind$	0.4256	0.0422	0.0000
$\Delta lnrind_{t-1}$	-0.7686	0.0965	0.0000
$\Delta lnrind_{t-2}$	-0.1089	0.0853	0.2306
$\Delta lnrind_{t-3}$	-0.2292	0.0760	0.0130
$\Delta lnrind_{t-4}$	-0.4477	0.0806	0.0002
$\Delta lnsi$	0.0458	0.0079	0.0002
$\Delta lnsi_{t-1}$	0.0371	0.0090	0.0022
$\Delta lnsi_{t-2}$	0.0601	0.0093	0.0001
$\Delta lnsi_{t-3}$	0.0778	0.0125	0.0001
$\Delta lnsi_{t-4}$	0.0706	0.0088	0.0000
C	0.0114	0.0101	0.2839
$ECMT_{t-1}$	-0.6431	0.0956	0.0001

Adj. R^2= 0.977854,
S.E. of Regr. = 0.005996,
AIC = -7.172046, SBC = -6.200635,
F-stat. = 67.23285, F-prob. = 0.000,
D-W stat. = 2.653100

Table 21. Level Equation with Constant and Trend (Singapore)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGOİL	-0.051292	0.018596	-2.758277	0.0095
LOGRIND	0.830617	0.394823	2.103771	0.0433
LOGSİ	-0.037923	0.127148	-0.298258	0.7674
C	5.187638	8.170990	0.634885	0.5300

In the case of Singapore in Table 21, the long-run coefficients of real industry value added (rIND), and oil prices (OIL) are statistically significant. This means that real industry value added (rIND) and oil prices (OIL) have an impact on real GDP. If rIND increases by 1%, GDP will increase by 0.8306%. If oil prices increases by 1%, GDP will reduce by 0.05129%. In the short run, Table 20 illustrates the results of error correction model for short run coefficients and speed of adjustment. Most variables in the case of Singapore are found statistically significant at 1 per cent level and error correction term is -0.6431 which is statistically significant as expected. This means that real GDP converge to their long run equilibrium level at 64.31 per cent by contribution of real industry value added (rIND), stock indices (SI) and oil prices (oil). This model shows that there exists no problem in terms of R2 scores, F-value as well as Durbin-Watson statistic (i.e autocorrelation problem).(At lag 0, if oil prices increase by 1%, GDP will increase by 0.0620%. At lag 3, if oil prices increase by 1%, GDP will reduce by 0.0201%. At lag 4, if oil prices increase by 1%, GDP will reduce by 0.0358%. At lag 0, if rIND increases by 1%, GDP will increase by 0.4256%. At lag 1, if rIND increases by 1%, GDP will reduce by 0.7686%. At lag 2, if rIND increases by 1%, GDP will reduce by 0.1089%. At lag 3, if rIND increases by 1%, GDP will reduce by 0.2292%. At lag 4, if rIND increases by 1%, GDP will reduce by 0.4477%. At lag 0, if SI increases by 1%, GDP will increase by 0.0458%. At lag 1, if SI increases by 1%, GDP will increase by 0.0371%. At lag 2, if SI increases by 1%, GDP will increase by 0.0601%. At lag 3, if SI increases by 1%, GDP will increase by 0.0778%. At lag 4, if SI increases by 1%, GDP will increase by 0.0706%).

Table 22. The ARDL Error Correction Model for RGDP (South Africa)

Regressor	Coefficient	Standard Error	p-value
$\Delta lnrgdp_{t-1}$	-0.5488	0.0796	0.0000
$\Delta lnrgdp_{t-2}$	-0.4418	0.0773	0.0002
$\Delta lnoil$	-0.0073	0.0028	0.0281
$\Delta lnoil_{t-1}$	-0.0360	0.0036	0.0000
$\Delta lnoil_{t-2}$	-0.0459	0.0043	0.0000
$\Delta lnoil_{t-3}$	-0.0265	0.0038	0.0000
$\Delta lnrind$	0.5613	0.0301	0.0000
$\Delta lnrind_{t-1}$	0.4945	0.0529	0.0000
$\Delta lnrind_{t-2}$	0.5448	0.0688	0.0000
$\Delta lnrind_{t-3}$	0.2137	0.0377	0.0002
$\Delta lnsi$	0.0052	0.0022	0.0424
$\Delta lnsi_{t-1}$	0.0041	0.0026	0.1430
$\Delta lnsi_{t-2}$	0.0171	0.0024	0.0000
$\Delta lnsi_{t-3}$	0.0168	0.0027	0.0001
C	0.0013	0.0017	0.4633
$ECMT_{t-1}$	-0.3238	0.0250	0.0000

Adj. R^2= 0.988140,
S.E. of Regr. = 0.002696,
AIC = -8.719031, SBC = -7.944818,
F-stat. = 139.8641, F-prob. = 0.000,
D-W stat. = 2.018407

Table 23. Level Equation with Constant and Trend (South Africa)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGOİL	0.0456	0.0304	1.5004	0.1455
LOGRIND	0.7582	0.3406	2.2255	0.0349
LOGSİ	0.0260	0.0167	1.5579	0.1313
C	-10.8389	7.9267	-1.3673	0.1832

For the results of South Africa in Table 23, the long-run coefficients of real industry value added is only statistically significant. This means that real industry value has an impact on real GDP. If rIND increases by 1%, GDP will increase by 0.7582%. In the short run, Table 22 illustrates the results of error correction model for short run coefficients and speed of adjustment. Most variables in the case of South Africa are found statistically significant at 1 per cent level and error correction term is -0.3238 which is statistically significant as expected. This means that real GDP converge to their long run equilibrium level at 32.38 per cent by contribution of real industry value added (rIND), stock indices (SI) and oil prices (oil). This model shows that there exists no problem in terms of R2 scores, F-value as well as Durbin-Watson statistic (i.e autocorrelation problem). (At lag 0, if oil prices increase by 1%, GDP will reduce by 0.0073%. At lag 1, if oil prices increase by 1%, GDP will reduce by 0.0360%. At lag 2, if oil prices increase by 1%, GDP will reduce by 0.0459%. At lag 3, if oil prices increases by 1%, GDP will reduce by 0.0265%. At lag 0, if rIND increases by 1%, GDP will increase by 0.5613%. At lag 1, if rIND increases by 1%, GDP will increase by 0.4945%. At lag 2, if rIND increases by 1%, GDP will increase by 0.5448%. At lag 3, if rIND increases by 1%, GDP will increase by 0.2137%. At lag 0, if SI increases by 1%, GDP will increase by 0.0052%. At lag 1, if SI increases by 1%, GDP will increase by 0.0041%. At lag 2, if SI increases by 1%, GDP will increase by 0.0171%. At lag 3, if SI increases by 1%, GDP will increase by 0.0168%).

Table 24. The ARDL Error Correction Model for RGDP (Turkey)

Regressor	Coefficient	Standard Error	p-value
$\Delta lnrgdp_{t-1}$	0.1482	0.0506	0.0110
$\Delta lnrgdp_{t-2}$	0.0722	0.0412	0.1014
Δlnoil	0.0102	0.0046	0.0457
Δlnrind	0.6453	0.0275	0.0000
C	0.0036	0.0030	0.2518
$ECMT_{t-1}$	-1.3695	0.2589	0.0001

Adj. R^2= 0.978243,
S.E. of Regr. = 0.007286,
AIC = -6.762443, SBC = -6.463723,
F-stat. = 171.8525, F-prob. = 0.000,
D-W stat. = 2.358264

Table 25. Level Equation with Constant and Trend (Turkey)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGOİL	0.0108	0.0018	5.9416	0.0000
LOGRIND	0.5832	0.0384	15.1602	0.0000
C	-6.3532	0.9387	-6.7677	0.0000

Finally, for the results of Turkey in Table 24, the error correction term does not work since it is higher than 1, although the model shows that there isn't any problem in terms of R2 scores, F-value as well as Durbin-Watson statistic (i.e autocorrelation problem). In the case of Turkey, long-run coefficients are statistically significant. This means that real industry value added (rIND) and oil prices (oil) have positive impact on real GDP. In the long-run, as can be seen from table 25 if oil prices increase by 1%, GDP will increase by 0.0108%. If rIND increases by 1%, GDP will increase by 0.5832%.

Chapter 6

CONCLUSION

6.1 Summary of Major Findings

It is vital to study and understand the connection between oil prices, exchange rates, and developing stock market movements, due to the fact that these developing economies continue to thrive and they will eventually have a greater impact on the global economy corroborated by Basher et al. (2012). The aim of this study is, therefore, to analyze the long term relationship between real income, oil prices, and various stock markets such as Frankfurt, Tokyo, Singapore, Johannesburg, Istanbul Stock Exchange, London and New York by using contemporary econometric methods. This study is of great importance for businessman, scholars and politicians as it focuses on this debate and offers an economic analysis.

Results of bounds tests confirm the existence of long term relationship between RGDP, oil prices and stock markets in the case of all of the markets under consideration that are in Japan, Germany, South Africa, Turkey, Singapore, UK, and USA. But, it is important to mention that in some of the countries, industrial value added has not been used as a controlled variable due to insignificant results; therefore, results can be summarized as follows: In the case of Germany, long term relationship has been obtained between real GDP and its regressors (industry, oil prices, and stock market) according to the F_{III} and F_{IV} scenarios as suggested by Pesaran et al. (2001). In the case of Japan, according to the F_{IV} and F_{III} scenarios, bounds tests confirm the existence of long term relationship between RGDP and its regressors (industry, oil prices, and stock market). In the case of Singapore, according only to the F_{IV} scenario, bounds tests confirm the existence of long term relationship between RGDP and its regressors (industry, oil prices, and stock market). In the case of South Africa, according to the F_{IV} and F_{III} scenarios, bounds tests confirm the existence of long term relationship between RGDP and its regressors (industry, oil prices, and stock market). In the case of Turkey, two models have been run for bounds tests: Firstly, according to the $F_{IV,}$ F_V and F_{III} scenarios, bounds tests confirm the existence of long term relationship between RGDP and its regressors (only oil prices, and stock market). Secondly, according to the $F_{IV,}$ F_V and F_{III} scenarios, bounds tests disapprove the existence of long term relationship between RGDP and its regressors (only OIL and SI); so further steps cannot be taken in this case in the long term. Bounds tests in the present thesis do not reveal any long term relationship between real income growth and oil and stock markets using sample period. Therefore, further steps again including error correction models will not be taken in the case of UK and USA.

In the next step, long run coefficients have been estimated for those models that have long term relationship as a result of bounds tests. In the case of Germany, the coefficient of oil prices is statistically significant and suggests that if oil prices increase by 1%, GDP in Germany will increase by 0.0342%. In the case of Japan, the coefficient of oil prices is not statistically significant. In the case of Singapore, the coefficient of oil prices is statistically significant and suggests that if oil prices increases by 1%, GDP will decrease by 0.05129%. This shows that oil prices and real income moved in opposite directions in the case of Singapore. However, the coefficient of oil prices is very low. In the case of South Africa, the coefficient of oil prices is not statistically significant. In the case of Turkey, the coefficient of oil prices is statistically significant and suggests that if oil prices increase by 1%, GDP will increase by 0.0108%. When the coefficients of stock market variable are considered, it is seen that it is only in Germany where the stock market has positive and significant impact on income in the long term period. In the case of the other variables, long term coefficients of stock market variables have not been found statistically significant. Finally, as a result of error correction models, it is seen that income of Germany converges to its long term level at high level (-0.8559) through industry, oil and stock markets. In Japan, the error correction term does not work since it is positive; this means that income in Japan does not converges to its long term level through oil and stock markets. In the case of Singapore, the error correction term is -0.6431 which is statistically significant and at a reasonable level. In South Africa, the error correction term is -0.3238 which is statistically significant and at a reasonable level again. And, in Turkey, the error correction term does not work since it is higher than one although it is significant and negative.

6.2 Policy Implications and Further Research

Results of the present studies generally proved a statistically significant impact of oil and stock markets on output growth in the selected economies except UK and USA. Results of this thesis have also shown that it is only Germany among the other sample countries where oil price and stock market variables depict positive long term impact on real income growth and enable real income to converge to its long term equilibrium level as high as 85.59%. When the impact of industrial value added in Germany is also taken into consideration, these findings are consistent with the reality that Germany is now the most powerful, productive, and efficient economy in Europe, as well as being one of the leading economies in the world.

Results of the present study suggest that countries need to benefit from oil and stock markets more effectively, except Germany. Oil production and consumption should be well managed and made more efficient out of its allocation for the economy. This research has also shown that industrial value added does not sufficiently contribute to the income of countries other than Germany. Allocation of resources and its management should also be done very carefully in the industrial sector of those countries under consideration. Finally, stock market investments should be encouraged in those countries, except again Germany. It is also seen that stock markets do not sufficiently contribute to the income of those countries.

Further research is recommended to scholars to employ alternative models using larger data spans and more countries as these will be possible based on data availability. This thesis has only focused on the impact of stock and oil markets on real income of selected countries. Finally, this thesis has used annual data in empirical analysis. Further analyses can be replicated by using smaller frequencies such as quarterly data in order to gain from the number of observations and for comparison purposes.

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