Interactions between Business Conditions, Economic Growth and Crude Oil Prices

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ABSTRACT

The aim of this thesis is to search for empirical relationship between business conditions and crude oil prices using time series analysis. Business conditions have been peroxide by real income and real industrial production as advised in the relevant literature. Results suggest that economic activity and industrial value added are in long term relationship with oil price movements in the selected countries. Gross domestic product and industrial production significantly are affected from oil prices worldwide. Real income and industrial value added converge to their long term paths significantly through the channel of oil price movements. Oil prices have negative impact on business activity in some countries while it has positive impact in some other countries. Therefore, the sign of coefficient of oil prices has been found mixed in this research study.

Keywords: Business Conditions; Oil; Error Correction Model.

ÖZ

Bu çalışma ekonomik büyüklük, sanayi üretimi ve petrol fiyatları arasındaki ili şkiyi çeşitli bölgeleri çinar delemeyi hedeflemektedir. Varılan sonuçlara gore bu değişkenler arasında ekonometrik olarak anlamlı ve uzun dönemli bir ilişki tespit edilmiştir. Petrol fiyatları uzun dönemde ekonomik ve sanayi aktivitesini anlamlı olarak etkilemektedir. Seçilmiş ülkelerdeki ekonomik büyüklük ve sanayi üretimi uzun dönem denge değerlerine petrol piyasaları aracılığıile yaklaşmaktadır. Son olarak petrol fiyatlarının etkisi bazı ülkelerde olumsuz yönde iken bazı ülkelerde olumlu yönde tespit edilmiştir.

Anahtar Kalimeler: İş Dünyası; Petrol; Hata Düzeltme Modeli.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF test	Augmented Dickey-Fuller test
ARDL	Auto Regressive Distributed Lag
ECM	Error Correction Model
ECT	Error Correction Term
IND	Industrial Production
GDP	Gross Domestic Product
LR	Long Run
PP test	Phillips-Perron test
ZA test	Zivot-Andrews Test

Chapter 1

INTRODUCTION

This thesis renders interactions between business conditions, crude oil prices and economic growth using data of World Bank between 1973 and 2011 for five regions. These are: Euro Area, European Union, Latin America and Caribbean, South Asia and sub-Saharan Africa.

Smith (2012) suggests that business conditions (BC) are influenced from factors such as economics, politics, natural environment and, regulations, which these factors have effects on business operations. In addition, there are some variables that impact on the business conditions in the second level, which are people who start new business, consumers, interest rates, inflation and unemployment. Business conditions affect prices for commodities and services, too. Some countries place several limitations in business activity while some other does not, Because of this reason, limited nations can enhance their tax bracket, credits and benefits (Smith, 2012)**.**

A rate of increase in physical output in a nation is referred as economic growth. Economic growth is simply percent increase in gross domestic product (GDP) or gross national product (GNP) in real terms. Development in the quality of life is a result of economic growth, also, according to Investopedia website (2012) (Investopedia, 2007) .Chen et al. (2011) predict that global economy would grow about 3.5 percent in 2012

and this amount will increase to 3.6 percent during three years of 2013 to 2016 and it will decline to 2.7 percent from 2017 to 2025 (Staff, 2007).

According to Herndon (2009) crude oil or petroleum is a natural liquid from hydrogen and carbon. Crude oil has more necessities in the world that most of them are necessary for life. Crude oil products are fuel for cars, trains, air plants, trucks and boats. It used to asphalts for road, plastic for toys, bottles, food warp and computers (Herndon, 2012). The main crude oil exporters are: (1) Saudi Arabia,(2) Russia,(3) Norway, (4) Iran, (5) United Arab Emirate, (6) Venezuela, (7) Kuwait, (8) Nigeria, (9) Algeria, (10) Mexico, (11) Libya, (12) Iraq, (13) Angola, (14) Kazakhstan. The main crude oil importers are (1) United States, (2) Japan, (3) China, (4) Germany, (5) South Korea, (6) France, (7) India, (8) Italy, (9) Spain and (10) Taiwan (World Bank, 2012).

Smith (2012) suggests that the political conditions have impact on the economy and economy has impact on the business conditions. Usually, countries with unstable political situation have poor business conditions, by contrast, stable political condition results powerful business conditions (Smith, 2012). There might be negative association between business conditions and economic growth as found by Fogelet et al. (2007) (Smith, 2012). Patric (2006) examines that one of the factors of business condition is government rules, which boost economic growth (C, C, & Scerieciu, 2006). Khilji (2006) investigates that crude oil price has a negative correlation with economic growth, because, rise in the price of crude oil production cause consumers to spend their most of income for oil commodities and pay little part of their income for other products and services. Moreover, cost of inputs increases with increase in oil prices and incur price of

non-oil products boost; These factors have direct effect behind a decline in the economic activity**;** because, although business activity has a positive relation with economic growth, increase in petroleum prices has a negative effect on business activity and on economic growth as well (Khilji, 2006)**.**

Álvarezet et al. (2009) confirm increase in oil prices has more effects on aspects of economy, finance and banking sector for importing countries than exporting countries, which there are direct effects and indirect effects. Changes in oil prices have direct effect on oil productions; for example, fuels or heating oil that is common for household consume. Indirect effect will be through a change in part of industry and cost of generated for goods and services, which petroleum outputs use those as inputs (Álvarez, Hurtado, Sánchez, & Thomas, 2009)**.**

1.1 Aim and Importance of the Study

This study investigates empirically possible interactions between business conditions, economic growth, and crude oil prices in some regional countries, which are Euro Area, European Union, Latin America and Caribbean, South Asia and Sub-Saharan Africa.

There are researches that have been done for industrial countries. But this thesis will analyze these interactions for five regional countries together, which are main oil importers or oil exporters in the world and includes both developing and developed economies as well.

In order to examine interactions between business conditions, economic growth, and oil prices, the latest econometric techniques including bounds tests and conditional error correction models will be used in the empirical analysis of the study.

1.2 Structure of the Study

This thesis contains seven chapters. Chapter one presents introduction. Chapter two look at the existing studies and researches till the date, briefly. Chapter three is overview of region countries under consideration. Chapter four defines theoretical setting of the study. Chapter five introduces data and methodology of this thesis. Empirical analysis for the study is carried out in chapter six. Finally, chapter seven draws conclusion and policy investigations from this research.

Chapter 2

LITERATURE REVIEW

This chapter will covers brief review of literature on interactions between business conditions, economic growth and crude oil prices till date.

2.2 Business Conditions

Lehwald (2012) argued that business cycle in Euro Area and European Union is similar, because, Euro Area is a part of European Union and business condition plays the important role in these regions. She used Bayesian dynamic factor model for business cycle in Europe and she investigated that between 1991 and 1998 macroeconomic variables were key factors in improving business condition and its increase. In addition, because of debt crises in Europe after 2002 and its impacts on the economic and politic, business situation fell (Lehwald & Sybille, 2012)**.**

Boschi and Girardi (2011) showed domestic business cycle in Latin America and Caribbean; which are strongly dependent on the U.S business condition rather than foreign countries. They determined domestic shocks, regional shocks, industrial shocks and exchange swing; which are some factors that affect the business condition in Latin America and Caribbean. However, Boschi and Girardi (2011) suggested that development in economics had direct impact on the improvement of business situation and it will be better than previous years (Boschi & Girardi, 2011)**.**

Chiuet et al. (2009) expressed south Asia has become a hub in production and consumption and most of its businesses focus is on the raw materials. They surveyed and discovered that there are powerful labor force and large consumer-growth in South Asia, which are factors for improving business situation. Chiuet et al. (2009) suggested that development in export production and technology led to economic growth. And this economic growth had positive effects on the business condition in South Asia.

Yasai Ardekani (2007) discovered that Sub-Saharan Africa had a good advance in the world; for this reason, competition in domestic business conditions increased and its countries became more efficient than previous years. However, they proposed cost-leadership strategy which is another factor for an appropriate business environment situation in Sub-Saharan Africa in 2012 (Acquaah & Yasai-Ardekani, 2007).

2.2 Economic Growth

Checherita Westphal (2012) expressed that economic crises, financial crises and government debts are major operatives for the decline in economic growth for Euro Area and European Union in the years (after 2008). However, Checherita Westphal (2012) shows that there is a negative relationship between economic growth and public debt, it means that rise in public debt or government debt causes decrease in economic growth (Westphal & Rother, 2012).

Loayzaet et al. (2004) investigates the increase in economic growth that caused poor countries to have a faster growth than the rich countries in Latin America and Caribbean. However, they argued that financial depth, people capital, infrastructure in public and low government load have a positive link with economic growth. By contrast, inflation

swing and external shocks have a negative relationship with economic growth in Latin America and Caribbean (Loayza, Fajnzylber, Calderón, & César, 2004).

Anwar and Cooray (2012) found out that financial development is the one of factors that affects the increase in economic growth, through direct channels and indirect channels in South Asia. These channels includes Finance based, bank based, low based, market based and financial service based. In addition, they suggested the expansion of the stock market, raise funds for investment; which leads to increase economic growth. Enhancements in these markets and instruments improve economic growth in South Asia (Anwar & Cooray, 2012).

Elbadawiet et al. (2011) argued that economic growth in sub Saharan Africa have a large dependence on the export. Decline in inflation, government's expenditures and people capital fund made economic growth to go up. Moreover, they have estimated that change in standard deviation has a direct effect on the decrease of economic growth. For instance, standard deviation changes resulted to a 1.1 percent decline in economic growth in 2010 in Sub-Saharan Africa (A, Elbadawi, Kaltani, Soto, & Rainmund, 2011).

2.3 Crude Oil Prices

Vos (2012) expressed that the high oil prices brings more advantages for export countries because the government revenue increases and this allows the government to boost public spending and increase domestic consumption; which is a successor for political improvement. In contrast, importing countries will face high import bills and a rising domestic demand. However, these factors will cause pressure on people life because price of goods and services will rise (Nations, 2012).

Crude oil is the main energy source, especially, for transportation in this region. Increase in crude oil price does have more effects on the European region; as a crude oil importer. Because of the sanction on Iran; although they are the forth exporter in the world caused oil prices to increase more than previous years in Euro Area and European Union, according to BBC website (2012) (News, 2012). Moreover, Tverberg (2012) believes that decrease in crude oil production has negative impacts on the Euro Area and European countries; such as boost in unemployment, deficit in job and rise in tax revenue (Tverberg, 2012).

Ijjasz Vasquez (2012) argues that Latin America and Caribbean are divided into two parts; parts one includes oil exporter countries and part two are the oil importer countries. Rise in oil price, makes income level to go up, and revenues and life quality to improve. However, he presents that exporter countries has a better situation than importer countries when there is increase in crude oil price. Importer countries using oil more than 90 percent for energy consumption; therefore, they decided to replace another sources instead of oil products (Camara, 2012).

Pham (2012) finds out that crude oil high demand in South Asia and this region as an oil importer brings bad condition and effects by oil price boost. There is some embargo for Iran but India still buys 12 percent of its oil from Iran (Pham, 2012). Cunado and Gracia (2004) suggest that there are relations between oil price, price index and economic activity, it means oil price has a considerable impact on the both of them (Cunadoa & Perez de Gracia, 2004).

Ghazvinian (2011) Suggest that most of oil importers preferred to buy their oil from Sub-Saharan Africa, because of appropriate growth in oil industry, boost in quality of oil, decline in transport costs and conducive environment for oil companies (Ghazvinian, 2011). Demachi (2012) investigates that changes international oil price and its swing on the macroeconomic condition, Money supply (M2), exchange rate, domestic price levels and diplomacy interest rate. However, he suggests change in international oil price and domestic price volatility does have an impact on the exchange rate in Sub-Saharan Africa. In addition, there are positive relations between oil price and money supply (M2), hence, rise in international oil price will cause a significant increase in money supply (M2) and to the domestic market (Demachi & Kazue, 2012).

2.4 Interactions between Business Conditions and Oil Prices

This study investigates relationship between business conditions and oil prices. Boschi and Girardi (2011) suggest tha teconomic conditions have a positive relationship with business conditions in previous parts (Boschi & Girardi, 2011). Krichene (2008) forecasts, which oil price has a positive interaction with economic situation. Increase in oil prices are expected to have negative influences on the economies since it increases the costs of production. Ratner (2011) argues that inflation is one of factors, which has influence on oil prices, because, boost in oil prices increases energy prices; therefore, it changes trades between importer countries and exporter countries and it has a direct effect on business conditions (Ghosh & Palash, 2010).

Chapter 3

OVERVIEW OF COUNTRIES AND REGIONS UNDER CONSIDERATION

3.1 Overview of World Countries and Regions

This chapter investigates the trends in GDP, Crude oil price and industrial production as a proxy for business conditions (Chen & Czerwinski, 2000), in some countries, which includes: Euro Area, European countries, Latin America and Caribbean, South Asia and Sub Saharan Africa by graphical analysis.

There are 196 countries of the world, which are divided into eight regions. These regions represent obvious division of the world's countries. These eight regions are: (1) Asia, (2) Middle East, North Africa and Greater Arabia, (3) Europe, (4) North America, (5) Central America and Caribbean, (6) South America, (7) Sub Saharan Africa, (8) Australia and Oceania, which this thesis will analyze four regions (Rosenberg M. , 2011).

The most important countries in Asia and Middle East includes: Iran, India, Saudi Arabia, China, Pakistan, Japan, Russia, Turkey, Lebanon and United Arab Emirates. However, the main countries in North Africa are: Algeria, Egypt, Libya, Morocco,

Sudan and Tunisia. Germany, France, Italy, Spain and United Kingdom are significant countries in Europe according to politically, economically and financially (Plan, 2012).

The most important countries in North America, Latin America and Caribbean and Central America are: Brazil, Mexico, Cuba, Nicaragua, Argentina, Ecuador and Venezuela. The main countries in Sub Saharan Africa includes: Ghana, Sudan, Somalia, Nigeria, Zimbabwe and Kenya (UCSI, 2012).

3.2 Euro Area

Euro Area is formally the name of monetary union area, which includes 17 member state of European Union (EU), and their common currency is Euro. Euro zone was established on the first of January 1999. In addition, Germany, French, Italy, Spain, Cyprus, Belgium, Austria, Finland, Estonia, Greece, Ireland, Luxembourg, Malta, Netherland, Portugal, Slovakia and Slovenia are in Euro Area as of 2012 (Union, 2007).

3.2.1 Gross Domestic Product

The graph (1) in figure (1) presents LGDP for Euro Area from 1973 to 2010. It displays upward growth from 1975 to 2008. In the three periods, it had positive swings which maximum values are between 2007 to 2008 and after that shows the smooth drop in the end of 2009.

Euro Area is the largest after the U.S in economy (Economics, 2012). The economic recession could not affect the economic growth in Euro Area to 2002; therefore, the economy grew by 0.9 percent in 2002. Some factors caused this growth that consisted: export and industry. At the first month of 2002, net exports had development of about 1.2 percent that remained till the end of the 2002. After 2002, Euro zone experienced

feeble consumer consumption, because increase in unemployment, low income level and weak increase in wages incurred a decline in people purchasing power (Financial, 2003). Euro Area had increases in GDP by 0.3 percent in 2012 (Eurostate, Euro area GDP, 2012). Financial crises are in the Euro Area leading to the weakest growth in 2012 and 2013. There are more factors, which have created a decrease in gross domestic product. Some of them are: low domestic demand, increase in oil price, business trust, debt crises and bad supplier condition (Staff E. , 2012).

3.2.3 Industrial Production

The graph (2) in figure (1) shows L industry in Euro Area from 1973 until 2010. There is an upward behavior, although fluctuations are sensible. Between 1987 to 1994, it had sudden growth than the maximum range of graph is in 2007 and after that, rapid decline occurred until the end of 2009.

Industrial sector had a weakness in 2002, especially in manufacture and goods production (Financial, 2003). In Euro Area, industrial production had positive growth rather than economic growth. Germany as one of the powerful country in Euro Zone rose production that helped other countries like Spain and Netherland, to compensate the decrease in its region (Bloomberg, 2012). There are various ways for improving this situation. Appropriate suggestions are that; countries should increase their export to developing economics and also raise factory outputs (Hannon, 2012). Industrial production fell to 1.1 percent in December 2011 to be compared with November 2010 (Eurostate, Industrial production In Euro Area, 2012). However, it grew by 0.6 percent in July 2012 (Eurostate, 2012).

3.2.4 Crude Oil Price

The graph (3) in figure (1) indicates changes in L oil price in Euro Area for 1973 to 2010. It was very volatile. There is unexpected increasing in oil price in 1978 until 1980 and then it had a steep downward slopping in 1987. After 1987 Euro Area was faced with a significant fluctuation till the end of 2002. A sharp growth happened between 2003 and 2008.

Crude oil price had experienced more variation after 1975. Crude oil price have significantly climbed after 2010. European Union and United States prohibits oil imports from Islamic Republic of Iran and Syria Arab Republic to their countries, which is the main reason that this triggered this increase (Nations, 2012)**.**

Ireland, Italy and Greece are the big losers in Euro Area, and Iran's condition was pushing the economies of the Euro Area apart. In addition, the most important problem is that there are no guarantees oil prices will comes down (Allison & Swann, 2012)**.** The average crude oil price decline was in 2011; furthermore, it grew in 2012, but according to forecasts, crude oil prices are expected to fall in Euro Area in 2013 (Nations, 2012)**.**

3.3 European Union

European Union or EU is a unique economic and political union, which includes 27 members state, and they are located in Europe. However, European Union was established in 1951, and their current currency is Euro (Union, 2007)**.**

3.3.1 Gross Domestic Product (GDP)

The graph (4) in figure (1) shows LGDP in European Union from 1973 until 2010. It has upward movement with less volatility. In two time periods, the European Union had

more growth in comparison with other periods. The maximum term of growth is between 2006 and 2008.

The GDP behavior is similar with Euro Area between 1973 and 2012. After a great decline in economic growth in 2011, European economies are conducted to moderate recession, and estimated GDP will have a smooth rise at the end of 2012, and it will continue in 2013. Increase in domestic demand, decrease in unemployment rate, inflation and budget deficit are reasons, which are helping to recovery for gross domestic product (Affairs, 2012).

3.3.2 Industrial Production

The graph (5) in figure (1) is related to the industry of European countries similar to graph (2) in figure (1) in Euro Area that is explained before.

Industrial production in European rose after 2008, it reached 2.6 % in 2012 (State, 2012). Industrial production evolution dropped in 2012 than 2011 because the production of capital goods and intermediate goods decreased (Press, 2012). Germany as the powerful country in European Union had more effects on the industrial production for the region. Therefore, a decline in German's export has been caused a drop in European Union in the third quarter of 2012. Enhancement in US and Chinese's demand and potential internal demand can help Germany and European Union to compensate the crisis in industry (Koehler, 2012).

3.3.3 Crude Oil Price

The graph (6) in figure (1) displays variations in L oil price for European from 1973 to 2010. It had volatile behaviors. There are no changes in the periods between 1975 and

1978. It has maximum value in 1980 and after that European faced to a sharp decline in oil price in 1986. A huge negative growth happened for them in1998. Then after that year they had significant growth until the end of 2008.

Changes in the crude oil prices in European Union are similar with Euro Area from 1973 until now. EU is a net importer of crude oil**.** In European countries, crude oil price had grown to about 30 percent in 2010, and it significantly rose by 40 percent, and this increase continued in 2012 (Chaudhuri, 2012)**.** Decline in crude oil supply from Iran as a third supplier due to the embargo, have increased oil price in EU in 2012 (Bureau, 2012)**.** High oil price have more effect on EU rather than US (Tverberg, 2012)**.**

3.4 Latin America and Caribbean

Latin America and Caribbean are part of America, which includes 19 countries and Mexico is it's the largest city. Spanish, Portuguese and French are common languages in Latin America and Caribbean. Potato, chocolate, sugar, oil, banana and coca are some of its important productions (Outlook G. E., 2012)**.**

3.4.1 Gross Domestic Product (GDP)

The graph (7) in figure (2) represents LGDP for Latin America and Caribbean in 1973 until 2010.There is an upward movement without sensible fluctuation. It has more increase in GDP than other period since 1978 to 1983 and then it went up without any slump.

Mexico, Brazil and Argentina have the best economies in their region. However, GDP is in the highest value in Chile, Mexico and Argentina and Paraguay, and Bolivia has the lowest GDP in Latin America and Caribbean. In addition, they have goods and services

consumption in the world average consumption (Bank, Latin America And Caribbean, 2005).

After GDP decline in Latin America and Caribbean in 2009, it had positive growth in GDP by 6 percent in 2010 (Comunication, 2010). Although, the world have been experiencing recession since 2003, but GDP in Latin America and Caribbean have had positive growths in these years and it is forecasted that GDP will have 4 percent rise in 2013. There are more reasons for growth in GDP, which some of them are: increase in a number of factors, affluence in natural resources, financial accretion, domestic demand, business trades, quality of macroeconomic policies and economic relation with China (Economist, 2011).

3.4.2 Industrial Production

The graph (8) in figure (2) is related to the L industry of Latin America and Caribbean has upward behavior with medium volatility. From 1972 it had significant increase until 1980 and then had swings till the end of 2003; after that it grew up in terms; from 2004 to 2008. In addition, industrial production had growth in 2012.

Industrial production had a significant boost after 2010, because quick growth in industrial outputs in East Asia. Moreover, industrial production in Brazil and Argentina went down to level records in 2009 (Bank, Industrial Production, 2012). Mexico, Colombia and Honduras play an important role in industry; electronic, automotive, software, shoes, leather, iron, steel and fiber-textile-apparel are most important sectors in industry for Latin America and Caribbean (Alberto Melo, 2006).

3.4.3 Crude Oil Price

The graph (9) in figure (2) illustrates L oil price alterations in Latin America and Caribbean From 1973 to 2010. It has downward treatment with so much volatility. From 1976 to 1979 it doesn't have any change or any swing but after that there were growth in oil price which is the maximum growth for Latin America and Caribbean from 1972 to 2011. The minimum growth for them happened in 1998.

Latin America and Caribbean are one of the top five exporters in the world; oil is its main export good. Venezuela and Ecuador are net exporters. Guyana, El Salvador, Honduras and Dominican Republic are net importer for oil. Increase in crude oil prices caused the income levels to goes up and then domestic demand also rose. But this boost endangers the gap relation between oil price goods and other commodities, which people demand a climb to non-oil production and mineral goods (Region, 2006)**.**

3.5 South Asia

South Asia or Southeastern Asia is a sub region of Asia, which have 11 countries and each country has own language and own currency. The its most important countries are India, Bangladesh, Sir Lanka, Nepal, Bhutan, Maldives, Afghanistan and Pakistan. South Asia has most trade and export to Europe (Nuttin, 2011)**.**

3.5.1 Gross Domestic Product (GDP)

The graphs (10) in figure (2) related to LGDP in South Asia have upward movement. There is no any sensible volatility.

The gross domestic product dropped to 7.1 percent in 2011 rather than 8.6 percent in 2010 in South Asia. However, it is predicted to reach about 5.8 percent at the end of

2012 (Waldorf, 2012). At the first month in 2011, industrial production declined by 1.16 percent but it went up about 2.8 percent at the end of 2011 (Blogger, 2012).

In 2011, due to the unhygienic convenience and shortage in sanitation, GDP had 5 percent decline because of those reasons (Panda, 2012). However, crises in Europe caused 1.5 percent drop in economic growth for South Asia, because the volume of export to Europe decreased and rate of return capital decreased also. Deficit in electricity in India and Sir Lanka is one of the causes for decrease in GDP (Bank, South Asia, 2011).

Finance foundation, inflation, food prices are some of the sakes for downward behavior of GDP in 2012. South Asia can improve its economic condition and raise growth level with enhanced revenues, upgrade in finance infrastructure, quick manufacture growth and revitalizing agriculture (Dipak Dasgupta & May, 2010).

3.5.2 Industrial Production

The graphs (11) in figure (2) related to L industry in South Asia is similar with graph 10 and it has an upward movement also. They are not sensibly volatile.

India as the main and important country in South Asia plays the important role in industry and industrial production. India became the hub manufacturer for South Asia (Chauhan, 2012). Jewelry, leather, rice, and plastic are major exports goods in India (Exports, 2010). South Asia started to recover industrial productions after 2009 with expansions in factors, rebound external demand, restoration relation between consumers

and investors, improvement in business acting and increase in capital inflow (Bank, Prospects for South Asia countries, 2010).

3.5.3 Crude Oil Price

The graph (12) in figure (2) Shows L oil price changes for South Asia for 1973 to 2010. It has downward behavior with significant fluctuation. There are obvious periods of less volatility and periods of large volatility. It does not change anything between 1975 and 1978 but after that, it had maximum value in 1980 and then decrease started until it reached to minimum growth in 1998 and after this period the graph shows an inverse treatment.

South Asia is an importer region of crude oil. After the end of Iraq War in 2004, oil price experienced a significant rise and continued to 2007, oil demand rose annually in these periods. Boost in oil price does not have the appropriate effect on the importer countries in South Asia. Climbing commodities price and drop in volume of exports are some effects after increase in oil price (Bank, South Asia Region, 2012). The gross domestic product had 5 percent growth in 2010 and then GDP increased to 5.5 percent in 2011; however this amount remained constant in 2012 (Outlook R. E., Sub-Saharan Africa, Resilience and Risks, 2012). It is forecasted, which oil import go up 4 times in 2020 and 6 times in 2030 in comparison with level of oil import in 2010 (Bank, South Asia Region, 2012).

3.6 Sub Saharan Africa

According to geographically information, Sub-Saharan Africa is a part of Africa continent which is located in the south of the Saharan. Nigeria, Congo, Cameroon, Somalia, Mozambique, Angola, Ghana, Guinea, Madagascar, Central Africa Republic,

Zimbabwe and Sudan are some of countries in Sub-Saharan Africa. However, each of these countries has their own currency and their own language (Wallick, 2012).

3.6.1 Gross Domestic Product (GDP)

The graph (13) in figure (3) shows LGDP in Sub Saharan Africa from 1973 until 2010. It has upward treatment without any considerable fluctuation. Between 1978 and 1983 and also between 1987 and 1993 it had more growth than other years.

While global economies were in bad situations and experienced a decline every day, Sub-Saharan Africa became a strong economic hub in the world. Its domestic product rose by 5 percent in 2011 and this increase continue in 2012. Utilization in new source, enhance in residual condition, economic activity and rise in commodity price are some of the reasons for positive growth in Sub-Saharan Africa. Because of that Sub-Saharan Africa is a big exporter in oil production. Level of income went up by 7 percent in 2012, especially in Angola and Chad. Moreover, non-oil sectors recorded a great growth in economy, especially in Angola, Cameroon and Guinea. Low-income countries, such as Niger and Sierra Leon had GDP growth of 14 and 36 percent, respectively (Outlook, 2003).

3.6.2 Industrial Production

The graph (14) in figure (3) displays L industry for Sub Saharan Africa in 1973 to 2010.It has upward growth with some volatility and the most significant periods are between 1990 and 1996. However, Sub Saharan Africa slumped in 1993. There was a substantial rise after 1997.

Between 1980 and 1993, growth in industrial production was low for some reasons. For instance, there were no modern technology, international standards, powerful export, appropriate investment, skill labor and financial stability (Wangwea, 1998).

After 2000, business trades and economic condition improved. For these reasons, government decided to change public policy and country situation. It started with change in factor's conditions, infrastructure in factories and demand strategy (Aaron Macree, 2002).

Agriculture industry plays the important role in industry for Sub-Saharan Africa, Nigeria, Kenya, Tanzania; Ghana and Mozambique receive most of the bank credit for this sector. Soybean is a main export product of Sub-Saharan Africa; majority of soybean is produced in southeast Africa; the main importer of African soybean is United States. Therefore, increase in soybean meal and soybean oil demand caused the industrial production to rise as well in this region (Council, 2011). In 2011, exports value reached to 38 percent, which rose export earnings, then income level rose and finally quality of life increases (Bank, Sub-Saharan Africa Region, 2012). Crude oil prices and oil productions increased by 5.4 percent in 2012 to compare with 5.1 percent in 2011 for Sub Saharan Africa (Martinez, 2012).

3.6.3 Crude Oil Price

The graph (15) in figure (3) indicates the L oil price in Sub Saharan Africa for 1973 to 2010. It has downward movement with notable fluctuation. Sub Saharan Africa had suitable growth between 1978 and 1983 and in this period it had maximum value for oil price in 1980. There was a gradual decrease after 1984 until it caused a minimum

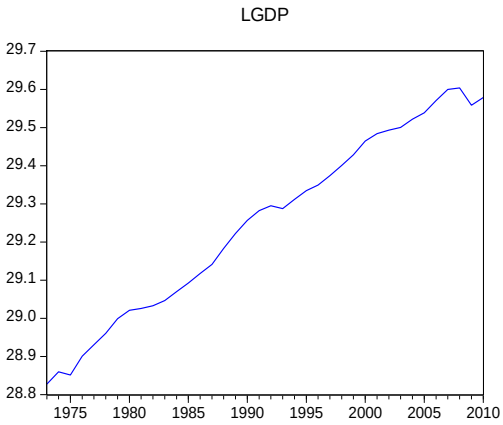
growth value for Sub Saharan Africa in 1998 and then it continued with increase in latest years.

Sub-Saharan Africa experienced two oil price shocks. First oil shock was between 1973 and 1974, that was when oil price had the large increase in all around the world, because of political and economic reasons, and then it resulted to oil embargo in most of the countries and regions like Sub-Saharan Africa and worldwide decline in outputs. They had a constant flow in oil price between 1975 and 1978. Second oil shock happened between 1979 and 1981. Its reasons were political factors and the revolution in Iran as a third oil supplier, lead world to international debt crises and oil's consumers to deficit. Sub-Saharan Africa was not able to continue to borrow from international banks. Therefore, these factors and this boost had destructive effects in this region. Although, increase in oil price should have appropriate effects in the exporter country like Africa, but Sub-Saharan Africa with its high exporters such as Angola, Gabon and Nigeria did not have any share of the windfall in global oil price (Lopes, 1998).

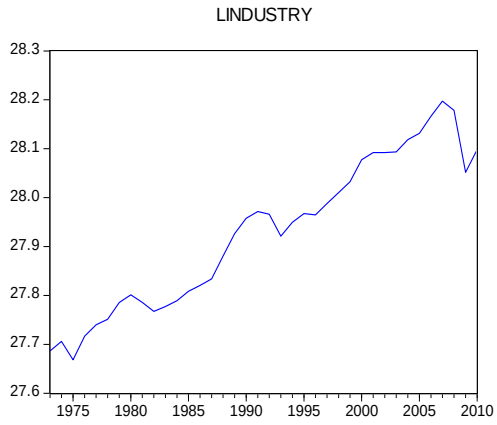
Oil products play a significant role in the economies of countries. Gasoline and diesel are oil products. Oil generated 11 percent of total electricity for Africa in 2007. Some countries in Sub-Saharan Africa are oil importer, such as: Madagascar, Kenya, South Africa and Tanzania (Masami Kojima & Sexsmith, 2010).

Rise in oil prices in recent years in Africa increased evolvement in the energy consumption of the world and resulted in people's wealth growth in Sub-Saharan Africa. In 2011, boost oil price and fuel products also had effects on average growth (GDP) in

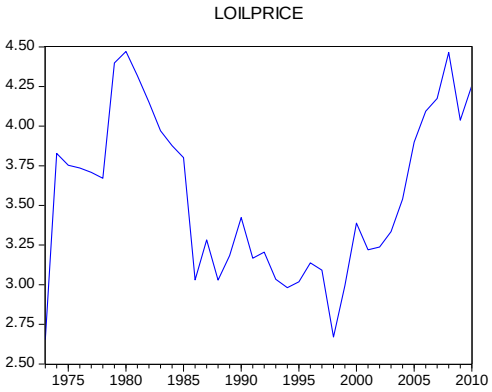
Sub-Saharan Africa (Pulse, 2010). Sub-Saharan Africa's situation is good in the world now; and growth in output and will remain as a strong hub in economy. In contrast, the world have experienced oil embargo and some countries are not able to import oil, such as some countries in Sub-Saharan. Therefore, they want to replace with new sources instead of oil production. There are forecasts that oil export will expand by 7.5 percent in 2013 for Sub-Saharan Africa (Outlook R. e., 2012).



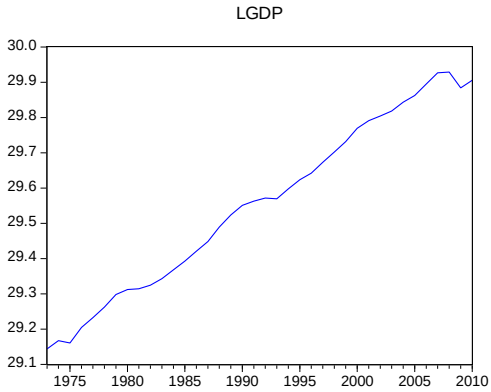
Graph 1



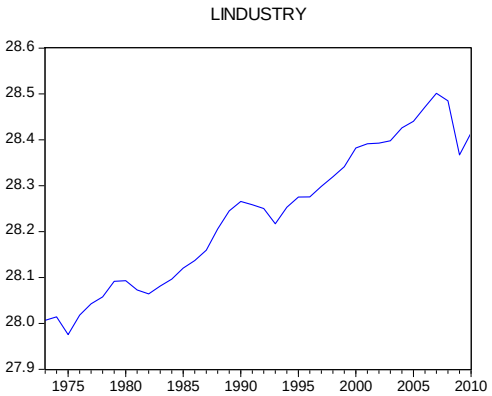
Graph 2



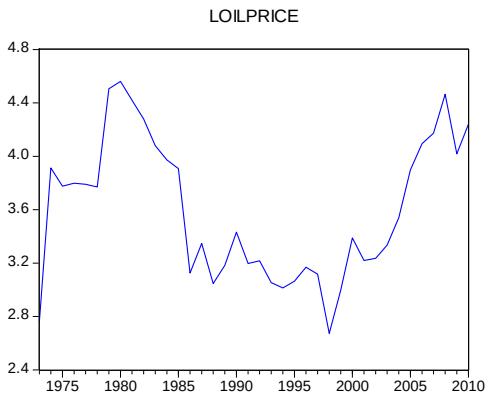
Graph 3



Graph 4

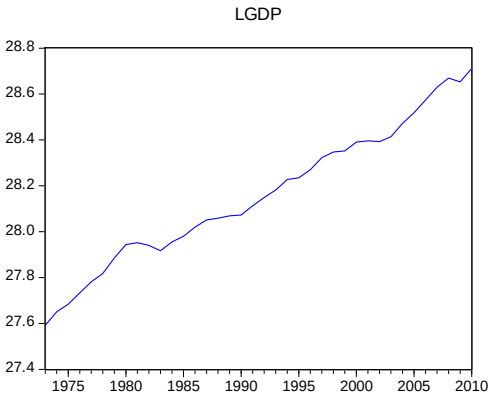


Graph 5

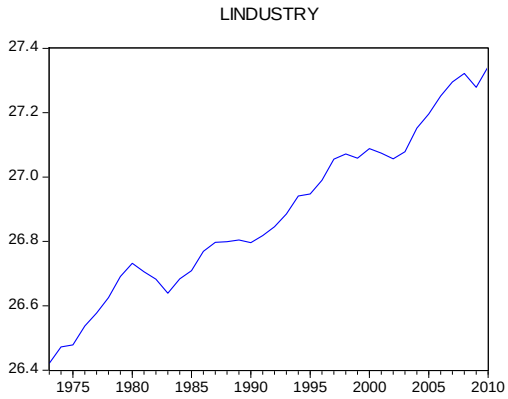


Graph 6

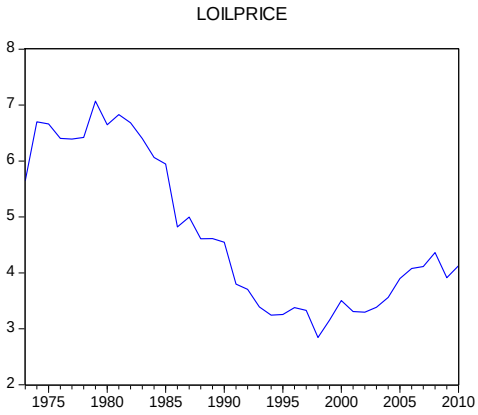
Figure 1: Trends in indicators



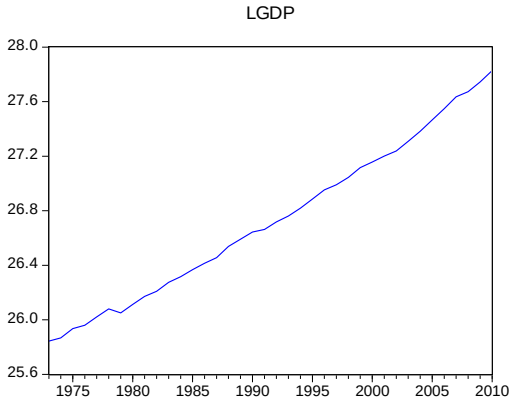
Graph 7



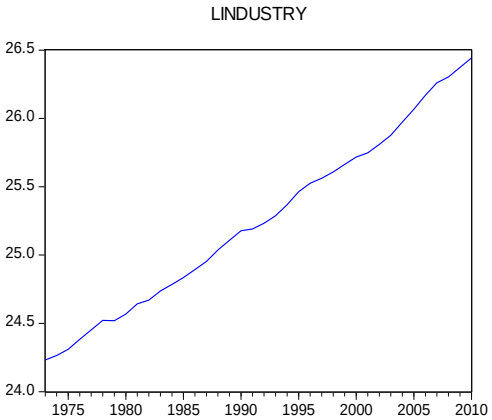
Graph 8



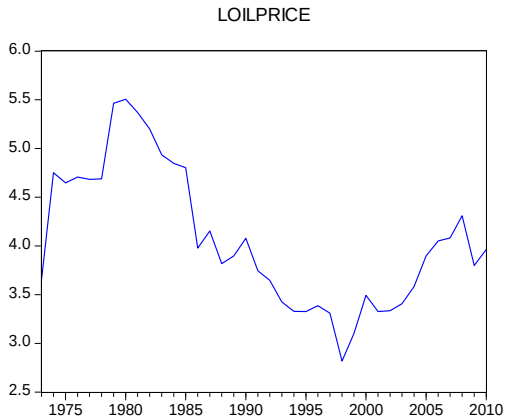
Graph 9



Graph 10

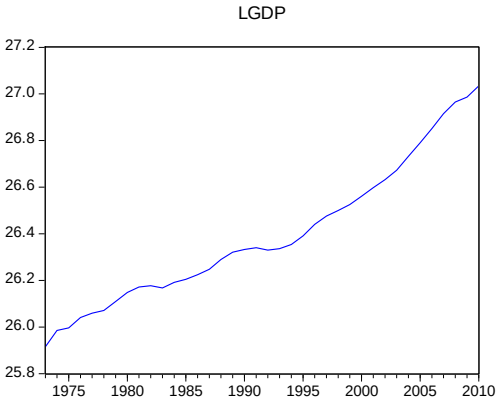


Graph 11

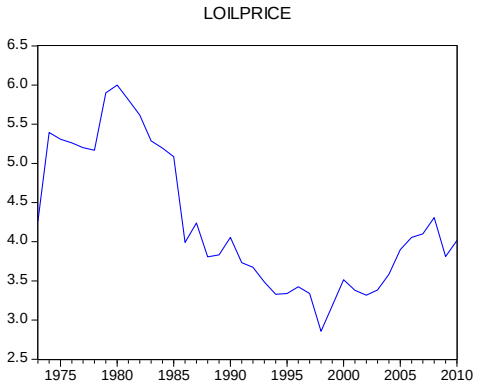


Graph 12

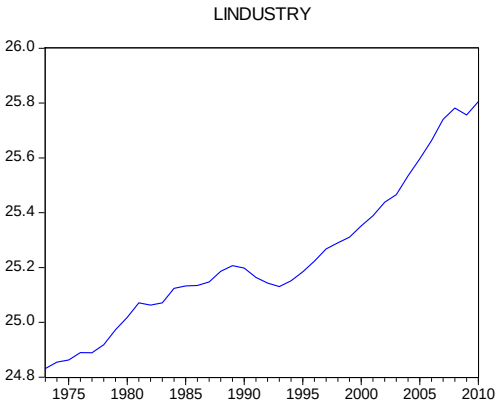
Figure 2: Trends in indicators



Graph 13



Graph 14



Graph 15

Figure 3: Trends in indicators

Chapter 4

THEORETICAL SETTING

This thesis investigates interactions between business conditions, crude oil prices and economic growth in five major origin countries that includes: Euro Area, European countries, Latin America and Caribbean, South Asia and Sub Saharan Africa. The theoretical setting that used in the empirical analysis part will introduced in this chapter. Industrial production will be used as a proxy for business conditions in parallel to the literature Chen (2010). Station point of this thesis is that oil prices and business conditions might be a determinant of real income. Therefore, the following functional relationship can be investigated (Katircioglu, 2010)**:**

$$GDP_t = f(\text{oil price}_{t,} \text{Industry}_t) \qquad \textbf{(1)}$$

According to equation (1), real gross domestic product is a function of crude oil price and industrial production. It is inferred that there might be a long term effect on real gross domestic product by crude oil price and industrial production.

There should be a natural logarithmic model of equation (1) in order to capture growth effects (Katircioglu, 2010)**:**

$$\ln GDP_t = \beta_0 + \beta_1 \ln \text{oil price}_t + \beta_2 \ln \text{industry}_t + \varepsilon_t \qquad \textbf{(2)}$$

Where ln GDP stands for the natural logarithm of real gross domestic product at period t; ln OIL stands for the natural logarithm of crude oil price; ln INDU stands for the natural logarithm of industrial production and ε stands for the error term of long term growth model. In equation (2) singe of coefficients for ln OIL and ln IND is positive. According to Katircioglu (2010), speed of isotropy for ln GDP can be fined by expressing error correction equation; because of that ln GDP for long term equilibrium value might not correct by the portion of regressors:

$$\Delta \ln GDP_{t} = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln \mathrm{GDP}_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln \mathrm{oilprice}_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln \mathrm{industry}_{t-j} + \beta_4 \varepsilon_{t-1} + u_t \qquad \textbf{(3)}$$

Where Δdenotes for a change in ln GDP, ln oil and ln IND, and ε_{t-1} stands for coefficient of error correction term (ECT) from equation (2). The sign of coefficient of ECT is expected to be negative and it proposes for receiving ln GDP to its long run level (Katircioglu, 2010)**.**

Chapter 5

DATA AND METHODOLOGY

5.1 Data

Data analysis for this thesis is based on annual time series data for the period between 1973 and 2010. Data is taken from World Bank Development indicator (2012). Variables of the study are GDP, crude oil prices, and industrial production which are all at constant zero USD prices.

This thesis introduces GDP for real gross domestic product; that is applied as economic growth measurement. Industry shows industry production and oil price stand for crude oil price. The thesis focuses on the interactions between business conditions, crude oil prices and economic growth in five major regions countries that includes Euro Area, European countries, Latin America and Caribbean, South Asia, and Sub Saharan Africa.

5.2 Unit Root Tests for Stationary Nature of the Variables

In econometrics, a unit root test investigates whether a time-series variable is stationary using an autoregressive model. Tests for unit root and defining the order of integration includes several methods. The Augmented Dickey-Fuller (ADF) (1979) test and the Phillips-Perron (PP) test are well-known tests in the econometrics literature. Both methods test the null hypothesis of a unit root against its alternative of no unit root process. The following model is used to test for unit root that includes drift and trend:

$$\Delta y_t = a_0 + \gamma y_{t-1} + a_2 t + \sum_{i=2}^{p} \beta_j \Delta y_{t-i-1} + \varepsilon_t \quad \textbf{(4)}$$

Where "a" stands for constant (drift), "y" stands for series, "t" is time (trend), "ε_t" stands for error term and "p" stands for number of the lags. Dividing γ with its standard error gives ADF test statistic that follows tow distribution (Gujarati, 2003)**.**

The first step is to check the stationary in time series data and specify the order of integration for non-stationary variables. Data is integrated in order (d), while it becomes stationary. However, a series can be stationary at, I (0), I(1) or I(d). It should be differenced, when a series is not stationary at I (0), in other words, it can be stationary at first or second difference. There are three regression models in ADF test. The first one and the most general one includes the trend with Intercept, and the second one includes intercept without trend. The last one that is the exclusive model is none or without Trend and without Intercept. The result of these tests will be brought up in next chapter.

Phillips and Perron (1988) supply a strong alternative test for unit roots to recognize vast diversity of stochastic processes for a disordered term. In this test, all steps have similar procedures with ADF test. The most applied method is the Newey-West heteroscedasticity autocorrelation:

$$\omega^2 = \gamma_0 + 2 \sum_{j=1}^{q} \left(1 - \frac{j}{q+1}\right) \gamma_j \quad \textbf{(5)}$$

$$\gamma_j = \frac{1}{T} \sum_{t=j+1}^{T} q\, \tilde{\varepsilon}_t \tilde{\varepsilon}_{t-j} \quad \textbf{(6)}$$

Where q stands for formularization lag, T stands for sample size and γ_j stands for the covariance, therefore, the PP statistic calculated as:

$$T_{pp} = \frac{\gamma t}{\omega} - \frac{(\omega 2 - \gamma 0) T s}{2\omega\sigma} \qquad \textbf{(7)}$$

Where σ stands for standard error of the test regression and T_b and s_b stands for standard error of β and t-statistic (Liew & Lau, 2005)**.**

In addition, to ADF and PP tests, Zivot and Andrews (1992) unit root tests will be also explained in this study for comparison purposes that takes breaks into consideration.

5.3 Zivot - Andrews Test

There is a common problem with classical unit root tests, such as the ADF, PP tests, that the possibility of a structural break is not taken into consideration; Therefore, Zivot and Andrews (1992) unit root tests can be used as alternative that considers structural breaks in the series. There exist three models in Zivot and Andrews (1992) to test for a unit root: (1) Model A, which allows for a one-time change in the level of the series; (2) Model B, which permits a one-time change in the slope of the trend function, and (3) Model C, which compounds one-time changes in the level and the slope of the trend function in the level of the series. Zivot and Andrews (1992) applies the following regression equations for the above three models.

$$\Delta y_t = c + \alpha y_{t-1} + \beta\, t + \gamma\, DU_t + \sum_{j=1}^{k} d_j \Delta y_{t-j} + \varepsilon_t \text{ (Model A)} \qquad \textbf{(8)}$$

$$\Delta y_t = c + \alpha y_{t-1} + \beta\, t + \theta\, DT_t + \sum_{j=1}^{k} d_j \Delta y_{t-j} + \varepsilon_t \text{ (Model B)} \qquad \textbf{(9)}$$

$$\Delta y_t = c + \alpha y_{t-1} + \beta\, t + \theta\, DU\, t + \gamma\, DT\, t + \sum_{j=1}^{k} d_j \Delta y_{t-j} + \varepsilon_t \text{ (Model C) } \mathbf{(10)}$$

Where DU_t stands for dummy variables for a medium shift at each possible break-date (TB), while DT_t stands for dummy of a trend shift variable.

The null hypothesis is $\alpha=0$ in all the three models, which displays that the series $\{y_t\}$ includes a unit root with a drift that deprives any structural break. In addition, the alternative hypothesis is $\alpha<0$ shows that the series with a one-time break is a trend-stationary procedure that happening at an uncertain point in time. The Zivot and Andrews (1992) method focuses on all points as a potential break-date (TB) and then runs for each possible break-date sequentially in a regression. Perron (1989) suggested that using either model A or model C is suitable for most economic time series that has adequately modeled (Muhammad Waheed & Ghauri, 2006)**.**

5.4 Bounds Tests for Long-Run Relationship Forecasting

Econometric is a long-run event. All the manners of econometrics investigate long run relationship among the variables, and if they have a long-run relationship then they should survey impacts of long run relationship on the other variables. In addition, variables are said to be in natural long run relationship, when they are stationary at their levels; however, when they are not stationary at their levels, absolutely they become stationary at first or second difference. Then, their long-run features are assumed to be omitted and become short term variables anymore. There are various procedures in testing for long run relationship. This thesis applies the models of Pesaran et al. (2001) who developed an alternative manner to Engel and Granger (1987), Johansen (1990) and Johansen and Juselius (1991) co-integration tests for testing for long run relationship

between the variables. Pesaran et al. (2001) allows a mixed order of integration for the case of regressors but not in the case of dependent variable that it is a prominent feature of bound test in comparison to the other tests for long run relationship. Hence, dependent variable should be integrated of order one in bound tests. Therefore, the bound test applying a manner that is used in this thesis for testing long term relationship between crude oil price, industry and GDP in the selected countries. This test, which was extended by Pesaran et al. (2001), can be used regardless of level integration of independent variables. The ARDL structure for estimating long term relationship includes the following error correction model:

$$\Delta \ln GDP_t = a_{0r} + \sum_{i=1}^{n} b_i \Delta \ln \text{GDP}_{t-i} + \sum_{i=1}^{n} c_i \Delta \ln \text{oil price}_{t-i} + \sum_{i=0}^{n} d_i \Delta \ln industry_{t-i} + \sigma_1 \ln \text{GDP}_{t-1} + \sigma_2 \ln \text{oil price}_{t-1} + \sigma_3 \ln \text{industry}_{t-i} + \varepsilon_{1t} \quad \textbf{(11)}$$

According to equation (11), Δ is the difference between operators, ln GDP_t is the natural logarithm of dependent variable, gross domestic product, ln oil price $_t$ and ln industry t are the natural logarithm of independent variables of crude oil price and industrial production, and ε_{1t}stands error term of the model. The F-test will be utilized to seek for a long run association between GDP and its possible determinants in equation (11). While ln GDP is dependent variable, the null hypothesis of no long term relationship is H_0:$\sigma_{1y} = \sigma_{2y} = \sigma_{3y} = 0$and the alternative hypothesis of having long term relationship is H_1:$\sigma_{1y} \neq \sigma_{2y} \neq \sigma_{3y} \neq 0$. There are five scenarios in order to estimate equation (11). This

thesis employed three scenarios of III, IV and V in F-test in parallel to the works of Katircioglu (2010) and Katircioglu (2009) (Katircioglu, 2010)**.**

5.5 Level Equation and Error Correction Model

In explanation of economics for co-integrated models, some time series data may show short-run dynamics, while in long-run they converge to the similar case of equilibrium. Because of this reason, study goes to the next step that sets up an Error Correction Model (ECM). After confirming long run relationship, long run and short run coefficients together with corrections term should be estimated (Gujarati, 2003)**.**

The ECM which utilizes the ARDL procedure will be computed for equation (2), once equation (11) has a long run relationship. The ECM can be estimated as:

$$\Delta \ln \mathrm{GDP}_t = \Delta\beta_0 + \sum_{j=1}^{p-1} \emptyset_j \Delta \ln \mathrm{GDP}_{t-i} + \sum_{i=1}^{k} \beta_{i0} \Delta \ln X_{it} + \varphi \Delta Z_t + \gamma(1,p) + \mathrm{ECT}_{t-1} + u_t \quad \textbf{(12)}$$

Where $\emptyset_j$, β_{ij} and φ are the coefficients for the short-run period. The coefficient of $\gamma(1,p)$ is error correction term which is expected to be negative (Gujarati, 2003). Furthermore, X stands for ln oil price and ln industry variables that are independent variables in this thesis. Again $\gamma(1,p)$ shows how fast ln GDP will converge to its long term equilibrium path through the channels of ln X_i variables. Having a statistically significant plus negative t-ratio for $\gamma(1,p)$ would be sufficient condition to make this inference (Katircioglu, 2010)**.**

Chapter 6

DATA ANALYSIS AND EMPIRICAL RESULTS

6.5 Testing for Unit Roots

This study applies two standard unit root tests before Zivot-Andrews (1992) test on time-series data (in logarithms) that are Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. Results are reported in Tables (1). Tests were done in both levels and first difference in both ADF and PP tests. In addition, there are three levels of restrictions (as mentioned before) for carrying out in ADF and PP tests. τ_T represents the most general model with intercept and drift, τ_M is the model with a intercept and without drift, τ Is the most restricted model without intercept and drift. The maximum lag length in Akaike Information Criteria (AIC), has been set to three between number of observations is less than 50 and it is assumed as being a small sample size. As discussed in the previous chapter, PP tests are superior to ADF tests. Therefore, results from PP tests will be mainly taken into consideration prior to Zivot and Andrews tests (1992) (Katircioglu, 2010).

Table (1) gives ADF and PP test reports for Euro Area and European countries. In the case of Euro Area, it is seen that the null hypothesis of unit root cannot be rejected in the case of ln oil variables according to all three models; therefore, they have unit root and are said to be non-stationary at their levels. On the other hand in the case of ln industry,

the null hypothesis of a unit root can be rejected in the most general model of ADF test but this is not confirmed by PP tests. Since PP test is superior to ADF test (Katircioglu, 2010)**,** we assume that industry also has unit root and are non-stationary at its level form; in this case we will need to conduct Zivot and Andrews (1992) test since there are also some volatilities or breaks in ln industry and ln oil price. It is important to mention that like ln GDP and ln oil price, ln industry also become stationary at its first difference since the null hypothesis of a unit root can be rejected. To summarize, ADF and PP tests in this thesis suggest that ln GDP, ln oil price, and ln industry are integrated of order one, I (1), in the case of Euro Area and European union.

Table (1) gives ADF and PP test reports for Latin America and Caribbean, South Asia, and Sub-Saharan Africa. In the all regions, it is seen that the null hypothesis of unit root cannot be rejected in the case of ln oil price variables according to all three models; therefore, they have unit root and are said to be non-stationary at their levels. On the other hand in the case of ln industry, the null hypothesis of a unit root can be rejected in the most general model of ADF test but this is not confirmed by PP tests. We will need to conduct Zivot and Andrews (1992) test again since there are also some breaks in ln industry and ln oil price. It is important to mention that like ln GDP and ln oil, ln industry also become stationary at its first difference since the null hypothesis of a unit root can be rejected. To summarize, ADF and PP tests in this thesis suggest that ln GDP, ln Oil, and ln industry are integrated of order one, I(1), in the case of Latin America and Caribbean, South Asia, and Sub-Saharan Africa.

Table 1: ADF and PP for Unit Root

Statistics level Euro Area	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-1.798305	(1)	-3.534246***	(1)	-2.206935	(0)
τ_M (ADF)	-1.770451	(0)	-1.131964	(0)	-2.209459	(0)
τ (ADF)	3.664599	(1)	2.101677	(0)	0.496058	(0)
τ_T (PP)	-1.302752	(2)	-2.563057	(3)	-2.425845	(3)
τ_M (PP)	-1.828673	(4)	-1.127615	(4)	-2.414303	(3)
τ (PP)	6.571384	(2)	2.613989	(5)	0.496058	(0)
statistic First difference	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-4.181436**	(1)	-5.569186*	(0)	-7.769820 *	(0)
τ_M (ADF)	-3.662576*	(1)	-5.610169*	(0)	-7. 849106*	(0)
τ (ADF)	-2.761575*	(0)	-5.124623*	(0)	-7. 964990*	(0)
τ_T (PP)	-5.015138*	(5)	-5.588163*	(5)	-7. 769820*	(0)
τ_M (PP)	-4.830984*	(4)	-5.648955*	(5)	-7. 863750*	(1)
τ (PP)	-2.643089*	(1)	-5.135125*	(1)	-7. 985398*	(1)
Statistic level European	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-3.201429	(1)	-3.747994**	(1)	-2.156843	(0)
τ_M (ADF)	-1.178051	(0)	-0.934802	(0)	-2.125777	(0)
τ (ADF)	3.563159	(2)	2.212927	(0)	0.439382	(0)
τ_T (PP)	-1.992284	(2)	-2.713512	(3)	-2.367708	(3)
τ_M (PP)	-1.131500	(3)	-0.904862	(5)	-2.315802	(3)
τ (PP)	6.939759	(2)	2.925676	(6)	0.498305	(1)
Statistic First Difference	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-4.179109**	(1)	-5.505103*	(0)	-7.840599 *	(0)
τ_M (ADF)	-4.034973*	(1)	-5.558028*	(0)	-7. 923868*	(0)
τ (ADF)	-2.494859**	(0)	-4.989854*	(0)	-8.045574*	(0)
τ_T (PP)	-4.599475*	(5)	-5.563007*	(6)	-7. 868292*	(1)
τ_M (PP)	-4.588263*	(4)	-5.641320*	(6)	-7. 869888*	(2)
τ (PP)	-2.365702**	(1)	-4.995465*	(1)	-7. 990774*	(2)

Table 1: ADF and PP for Unit Root (Continued)

Statistic level Latin America and Caribbean	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-2.517216	(1)	-2.974477	(1)	-1.208844	(0)
τ_M (ADF)	-0.494597	(0)	-0.461325	(0)	-1.899789	(0)
τ (ADF)	7.776332	(0)	4.736730	(0)	-0.890042	(0)
τ_T (PP)	-2,446202	(1)	-2.602504	(1)	-1.405571	(3)
τ_M (PP)	-0.494597	(0)	-0.502844	(2)	-0.931455	(3)
τ (PP)	6.987036	(1)	4.329072	(3)	-0.879409	(3)
Statistics First Difference	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-4.420972*	(0)	-4.525570*	(4)	-7.328819 *	(0)
τ_M (ADF)	-4.532638*	(0)	-4.700912*	(0)	-7. 239447*	(0)
τ (ADF)	-2.421751**	(0)	-3.356786*	(0)	-7. 050144*	(0)
τ_T (PP)	-4.281788*	(4)	-4.397241*	(5)	-7. 206627*	(3)
τ_M (PP)	-4.417833*	(4)	-4.530481*	(5)	-7. 049090*	(3)
τ (PP)	-2.421751**	(0)	-3.295104*	(1)	-6.843651*	(4)
Statistic level South Asia	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-0.761002	(0)	-1.063874	(0)	-2.376279	(0)
τ_M (ADF)	2.729335	(0)	2.056405	(0)	-1.465028	(0)
τ (ADF)	14.82974	(0)	16.01607	(0)	0.099881	(0)
τ_T (PP)	-0.761002	(0)	-1.249159	(3)	-2.560910	(3)
τ_M (PP)	4.322111	(4)	2.988212	(7)	-1.552650	(3)
τ (PP)	14.85074	(3)	14.06387	(2)	0.085009	(1)
Statistics First Difference	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-7.221538*	(0)	-4.721857*	(0)	-7.336060*	(0)
τ_M (ADF)	-6.054421*	(0)	-4.474030*	(0)	-7. 508041*	(0)
τ (ADF)	-0.053507	(2)	-1.114001	(0)	-7. 600537*	(0)
τ_T (PP)	-7.420201*	(3)	-4.654290*	(7)	-7.339956*	(2)
τ_M (PP)	-6.067000*	(3)	-4.442889*	(3)	-7. 475112*	(2)
τ (PP)	-0.776343	(4)	-0.634897	(6)	-7. 552405*	(2)

Table 1: ADF and PP for Unit Root (Continued)

Statistic level Sub-Saharan Africa	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-0.148813	(1)	-0.995360	(1)	-1.958367	(0)
τ_M (ADF)	1.447320	(2)	0.840897	(1)	-1.188836	(0)
τ (ADF)	2.977728	(1)	2.567988	(1)	-0.353155	(0)
τ_T (PP)	0.235774	(2)	-0.729033	(3)	-2.169836	(3)
τ_M (PP)	1.993980	(2)	1.179426	(2)	-1.192341	(2)
τ (PP)	6.164243	(4)	4.242480	(3)	-0.347808	(2)
Statistics First Difference	Ln GDP	Lag	Ln Industry	Lag	Ln Oil Price	Lag
τ_T(ADF)	-2.802320	(1)	-3.772262**	(0)	-7.281366*	(0)
τ_M (ADF)	-3.644086*	(0)	-3.545934**	(0)	-7.373209*	(0)
τ (ADF)	-1.980392**	(0)	-2.290048**	(0)	-7.397988*	(0)
τ_T (PP)	-4. 707900*	(2)	-3.809620**	(1)	-7.318443*	(2)
τ_M (PP)	-3. 746273*	(2)	-3.545934**	(0)	-7.345661*	(2)
τ (PP)	-1. 919028*	(1)	-2.290048**	(0)	-7.268234*	(3)

Note: This table reports the results of the Augmented Dickey-Fuller (ADF) And Pillps-Perron (PP) tests applied to time series data. The tests are based on the null hypothesis of a unit root. All of the series are at their natural logarithms. τ_T represent the most general model witha intercept and drift, τ_M is the model with a intercept and without drift, τ is the most restricted model without a intercept and drift. Numbers in brackets are lag length used in ADF test (as determined by AIC set to maximum 5) to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP test unit root test where performed from the most general to the least specific model by eliminating trend and intercept across the models. *, ** and *** denote rejection of the null hypothesis at the 1 percent, 5 percent and 10 percent levels respectively. Test for unit roots have been carried out in E-VIEWS 6.0.

6.2 Zivot-Andrews Test

Results of ADF and PP tests have shown that ln GDP, ln oil price, and ln industry are integrated of order one, I(1). But since there are some volatilities in the series, we need to confirm these by Z-A (1992) tests. This test includes three models, those are: model A, model B and model C as mentioned before and critical values at 1 percent, 5 percent

and 10 percent significance levels are -4.24, -4.80 and -5.34 respectively for model A, and -4.93, -4.42 and -4.11 respectively for model B and, -5.57, -5.08 and -4.82 respectively for model C. It is quoted to remind that the all and alternative hypothesis of ZA (1992) tests are the same with those in ADF and PP tests.

Zivot-Andrews (1992) unit root test results for Euro Area and European are given in panel 1 to 6 in table (2). It is seen that ZA (1992) test statistics for GDP and Industry are not statistically significant; therefore we cannot reject null hypothesis of a unit root for these series. On the other hand, ZA (1992) test statistic for oil price is statistically significant at 1 percent. Thus, the null hypothesis of a unit root is rejected for oil price in both regions. This is to conclude that GDP and Industry are non-stationary at level but become stationary at first difference, while oil price is stationary at levels. Therefore, GDP and Industry are said to be integration of order one, I(1), but oil price is integration of order zero, I(0) and, there is a long run relationship for it, in the case of Euro Area and European.

Table (2) from panels 7, 8 and 9 gives Zivot-Andrews (1992) unit root test results in this respect in Latin America and Caribbean. It is seen that ZA (1992) statistics for GDP and oil price are not statistically significant, therefore we cannot reject null hypothesis of a unit root for these series. On the other hand, ZA (1992) statistic for Industry is statistically significant at 1 percent. Thus, the null hypothesis of a unit root is rejected for Industry. This is to conclude that GDP and oil price are non-stationary at level but become stationary at first difference, While Industry is stationary at levels, and it is stationary at levels. Therefore, GDP and oil price is said to be integration of order one,

I(1), but industry is integration of order zero, I(0) and there is a long run relationship for it, in the case of Latin America and Caribbean.

Panels 10 to12 in table (2) give Zivot-Andrews (1992) unit root test results in this respect in South Asia. It is seen that ZA (1992) statistics for GDP and Industry are not statistically significant. Therefore, it cannot reject null hypothesis of a unit root for these series. On the other hand, ZA (1992) statistic for oil price is statistically significant at 1 percent. Thus, the null hypothesis of a unit root is rejected for oil price. This is to conclude that GDP and Industry are non-stationary at level but become stationary at first difference, while oil price is stationary at levels. Therefore, GDP and Industry are said to be integration of order one, I(1), but oil price is integration of order zero, I(0) and there is a long run relationship for it, in the case of South Asia.

Panels 13 to 15 in table (2) give Zivot-Andrews (1992) unit root test results in this respect in Sub-Saharan Africa. It is seen that ZA (1992) statistics for Industry is not statistically significant, therefore we cannot reject null hypothesis of a unit root for these series. On the other hand, ZA (1992) statistic for oil price and GDP are statistically significant at 1 percent. Thus, the null hypothesis of a unit root is rejected for oil price and GDP. This is to conclude that industry is non-stationary at level but become stationary at first difference, while oil price and GDP are stationary at levels. Therefore, industries are said to be integration of order one, I(1), but oil price and GDP are integration of order zero, I(0) and there is a long run relationship for them, in the case of Sub-Saharan Africa.

Table 2: Zivot and Andrews Test

Variables	L Oil Price	L GDP	L Industry
Panel 1 . Model A			
T-stat	-4.615	-3.637	-3.769
Lag	0.000	2.000	1.000
Panel 2 . Model B			
T-stat	-5.417	-4.090	-3.281
Lag	0.000	2.000	0.000
Panel 3 . Model C			
T-stat	-5.246	-3.947	-3.952
Lag	0.000	2.000	0.000
Panel 4 . Model A			
T-stat	-4.684	-3.542	-4.107
Lag	0.000	1.000	1.000
Panel 5 . Model B			
T-stat	-5.210	-3.656	-3.394
Lag	0.000	1.000	0.000
Panel 6 . Model C			
T-stat	-4.993	-4.218	-4.022
Lag	0.000	3.000	0.000
Panel 7 . Model A			
T-stat	-3.696	-2.161	-5.058
Lag	0.000	0.000	4.000
Panel 8 . Model B			
T-stat	-4.691	-3.902	-4.709
Lag	0.000	2.000	2.000
Panel 9 . Model C			
T-stat	-4.539	-2.703	-4.929
Lag	0.000	0.000	4.000
Panel 10 . Model A			
T-stat	-4.640	-2.775	-3.521
Lag	0.000	0.000	0.000
Panel 11 . Model B			
T-stat	-4.896	-3.400	-4.083
Lag	0.000	0.000	1.000
Panel 12 . Model C			
T-stat	-4.633	-3.353	-4.147
Lag	0.000	0.000	1.000
Panel 13 . Model A			
T-stat	-4.971	-2.335	-2.579
Lag	0.000	2.000	1.000
Panel 14 . Model B			
T-stat	-4.679	-5.102	-3.036
Lag	0.000	2.000	1.000
Panel 15 . Model C			
T-stat	-4.314	-4.970	-4.132
Lag	0.000	2.000	0.000

6.3 Bounds Tests for Long Run Relationships

After running ADF and PP test, this study performed Zivot-Andrews (1992) statistic for integrated of order zero I(0) or order one I(1) for variables. Then it determined some functions that include dependent variables and an independent variable. In order to investigate the existence of long run relationship in these functions, this study applies bound test that suggested by Pesaran et al. (2001) for this purpose. The proposed tests are based on standard F- statistics. Two sets of critical values are provided: one for lower bounds and the other for upper bounds. And this thesis considers three scenarios: F_{III}, F_{IV} and F_V. If F value cannot falls below lower limits then the null hypothesis of no level relationship is accepted. If it falls within lower and upper limits, test is inconclusive; and If F value falls beyond the upper limit then the null hypothesis of no level relationship is rejected and its alternative of level relationship is accepted (Pesaran, 2001).

Table (3) gives bounds test results for GDP= F (Oil price, Industry) relationships across the regions. In panel (1), we see that F_{IV}, F_V and F_{III} values are higher than upper limits at lag 3 and 1 (for F_{III}) in the case of Euro Area; therefore, the null hypothesis of no level relationship is rejected at optimum lag levels. This confirms the existence of long run relationship between GDP and its determinants, Oil price and Industry in Euro Area. This is also to say that GDP= F (Oil price, Industry) is a long run functional relationship in the case of Euro Area.

Panel (2) gives bound test results for Industry= F (GDP, Oil price) for the Euro Area in Table (3). F_{IV} and F_{III} values are higher than the upper limits at lag 3 and 1 (for F_{III}) in

the case of Euro Area; therefore, the null hypothesis of no level relationship is rejected at optimum lag levels. This confirms the existence of long run relationship between IND and its determinants, Oil and GDP in Euro Area. This is also to say that Industry= F (GDP, Oil price) is a long run functional relationship in the case of Euro Area.

Table (3) gives bounds test results for GDP= F (Oil price, Industry) relationships across the regions. In panel (3), we see that F_{IV}, F_V and F_{III} values are higher than upper limits at lag 3 and 1 (for F_{III}) in the case of European countries; therefore, the null hypothesis of no level relationship is rejected at optimum lag levels. This confirms the existence of long run relationship between GDP and its determinants, Oil price and Industry in European countries. This is also to say that GDP= F (Oil price, Industry) is a long run functional relationship in the case of European countries.

Table (3) gives bounds test results for GDP= F (Oil price, Industry) relationships across the regions. In panel (4), we see that F_{IV}, F_V and F_{III} values are higher than upper limits at lag 3 and 1 (for F_{III}) in the case of Latin America and Caribbean; therefore, the null hypothesis of no level relationship is rejected at optimum lag levels. This confirms the existence of long run relationship between GDP and its determinants, Oil price and Industry in Latin America and Caribbean. This is also to say that GDP= F (Oil price, Industry) is a long run functional relationship in the case of Latin America and Caribbean.

Table (3) gives bounds test results for Oil price= F (GDP, Industry) relationships across the regions. In panel (5), we see that F_{IV}, F_V and F_{III} values are not higher than upper

limits at all the lags in the case of Latin America and Caribbean; therefore, the null hypothesis of no level relationship is not rejected at optimum lag levels. This is not confirming the existence of long run relationship between Oil price and its determinants, GDP and Industry in Latin America and Caribbean. This is also to say that Oil price= F (GDP, Industry) is not a long run functional relationship in the case of Latin America and Caribbean.

Table (3) gives bounds test results for Industry= F (GDP, Oil price) relationships across the regions. In panel (6), we see that F_{III} value is higher than upper limits at lag 3 in the case of South Asia; therefore, the null hypothesis of no level relationship is rejected at optimum lag level. This confirms the existence of long run relationship between Industry and its determinants, GDP and Oil price in South Asia. This is also to say that Industry= F (GDP, Oil price) is a long run functional relationship in the case of South Asia.

Table (3) gives bounds test results for GDP= F (Oil price, Industry) relationships across the regions. In panel (7), we see that F_{IV} and F_{III} values are higher than upper limits at lag 3 in the case of South Asia; therefore, the null hypothesis of no level relationship is rejected at optimum lag level. This confirms the existence of long run relationship between GDP and its determinants, Oil price and Industry in South Asia. This is also to say that GDP= F (Oil price, Industry) is a long run functional relationship in the case of South Asia.

Table (3) gives bounds test results for Industry= F (Oil price, GDP) relationships across the regions. In panel (8), we see that F_{IV} and F_{V} values are higher than upper limits at lag

2 and 5 in the case of Sub-Saharan Africa; therefore, the null hypothesis of no level relationship is rejected at optimum lag levels. This confirms the existence of long run relationship between Industry and its determinants, Oil price and GDP in Sub-Saharan Africa. This is also to say that Industry= F (Oil price, GDP) is a long run functional relationship in the case of Sub-Saharan Africa.

Table 3: The Bound Test for Level Relationship

Variables		With Deterministic Trends F_{IV}	F_V		Without Deterministic Trends F_{III}	Conclusion
F_y=(ln GDP/ln oil price,ln industry) Panel 1						H_0 Rejected
	P=3	9.85[C]	8.65[C]	P=1	9.76[C]	
	4	1.84[a]	1.60[a]	2	3.93[b]	
	5	1.77[a]	1.78[a]	3	3.26[a]	
	6	1.34[a]	1.53[a]	4	0.98[a]	
F_y=(Ln industry/lnGDP,ln oil price) Panel 2						H_0 Rejected
	P=3	7.06[C]	6.40[b]	P=1	10.05[C]	
	4	1.57[a]	1.58[a]	2	4.24[b]	
	5	1.85[a]	2.05[a]	3	2.82[a]	
	6	1.35[a]	1.68[a]	4	1.05[a]	
F_y=(ln GDP/ln oil price,ln industry) Panel 3						H_0 Rejected
	P=3	7.00[C]	6.43[C]	P=1	8.19[C]	
	4	2.42[a]	2.03[a]	2	2.18[a]	
	5	5.02[b]	5.14[b]	3	2.63[a]	
	6	2.23[a]	2.68[a]	4	1.82[a]	
F_y=(ln GDP/ln oil price,ln industry) Panel 4						H_0 Rejected
	P=1	5.95[C]	7.76[C]	P=1	5.43[C]	
	2	2.70[a]	3.58[a]	2	1.60[a]	
	3	3.27[a]	4.36[a]	3	3.86[a]	
	4	1.41[a]	1.56[a]	4	1.04[a]	

Table 3: The Bound Test for Level Relationship (Continued)

Variables	With Deterministic Trends			Without Deterministic Trends		Conclusion
	F_{IV}	F_V		F_{III}		
F_y=(ln oil price/lnGDP ,ln industry) Panel 5						H_0 Accepted
	P=2	1.60[a]	1.56[a]	P=2	2.09[a]	
	3	2.54[a]	2.60[a]	3	3.36[a]	
	4	0.93[a]	0.91[a]	4	1.04[a]	
	5	3.33[a]	3.82[a]	5	2.51[a]	
F_y=(ln industry/ln GDP,lnoil price Panel 6						H_0 Rejected
	P=3	4.25[b]	4.78[b]	P=3	5.22[C]	
	4	2.07[a]	2.74[a]	4	2.08[a]	
	5	1.47[a]	1.93[a]	5	2.07[a]	
	6	2.85[a]	3.65[a]	6	4.17[b]	
F_y=(ln GDP/ln oil price,ln industry) Panel 7						H_0 Rejected
	P=3	5.23[C]	2.47[a]	P=3	7.18[C]	
	4	3.03[a]	2.56[a]	4	4.01[b]	
	5	1.53[a]	1.43[a]	5	2.10[a]	
	6	3.00[a]	3.26[a]	6	2.80[a]	
F_y=(ln industry/ln oil price,ln GDP) Panel 8						H_0 Rejected
	P=2	5.20[C]	6.25[C]	P=1	2.72[a]	
	3	3.69[b]	4.59[b]	2	2.13[a]	
	4	3.61[a]	3.61[a]	3	1.92[a]	
	5	8.03[C]	8.84[C]	4	2.79[a]	

6.4 Long-Run Equations and Error Correction Models

In the previous section, this study has investigated long run relationship between GDP and its regressors. The final step is to estimate level coefficient trend and ECM term in the short run period.

Table 4.1 presents the summary of conditional error correction models and level coefficients for GDP= F (Oil price, Industry) relationship under the ARDL approach for each region. For instance, in the case of first model of Euro Area, it is seen that GDP converges to its long term level by 23.88 percent thought the channel of oil prices and industrial production. Long term coefficient of oil price is -0.022 and for industry is 0.590 that those are statistically significant at 1 percent. It means that one percent change in oil price and industry will lead to 0.022 and 0.59 percent change in GDP in the negative direction. In the second model of Euro Area, it is seen that industry converges to its long term level by 33.12 percent even for thought the channel of oil price and GDP. Long term coefficient of oil price is 0.034 and for GDP is 1.546 that those are statistically significant at 1 percent. It means that one percent change in oil price and GDP will lead to 0.034 and 1.546 percent change in industry in the same direction.

According to the first model of European countries, it is seen that GDP converges to its long term level by 10.44 percent even for thought the channel of oil price and industry. Long term coefficient of industry is 0.546 that is statistically significant at 10 percent. It means that one percent change in industry will lead to 0.546 percent change in GDP in the same direction.

According to the first model of Latin America and Caribbean, it is seen that GDP converges to its long term level by 34.39 percent even for thought the channel of oil price and industry. Long term coefficient of industry is 0.860 and for oil price is 0.014 that are statistically significant at 1 percent. It means that one percent change in industry and oil price will lead to 0.860 and 0.014 percent change in GDP in the same direction.

According to the first model of South Asia, it is seen that GDP converges to its long term level by 40.15 percent even for thought the channel of industry and oil price. Long term coefficient of industry is 0.968 that is statistically significant at 1 percent. It means that one percent change in industry will lead to 0.968 percent change in GDP in the same direction. In the second model of South Asia, it is seen that industry converges to its long term level by 61.78 percent even for thought the channel of GDP and oil price. Long term coefficient of GDP is 0.974 that is statistically significant at 1 percent. It means that one percent change in GDP will lead to 0.974 percent change in industry in the same direction.

According to the first model of Sub Saharan Africa, it is seen that industry converges to its long term level by 10.21 percent even for thought the channel of GDP and oil price by. Long term coefficient of GDP is 0.708 that is statistically significant at 1 percent. It means that one percent change in GDP will lead to 0.708 percent change in industry in the same direction.

Table 4: Conditional Error Correction Estimation and Conditional Granger Causality Test under the ARDL Approach

Null Hypothesis	Distributed lags	ECM Coefficient	Level Coefficient
Euro Area			
GDP= F(oil price, industry)	5,1,3	-0.238*	-0.022* oil price 0.590* industry
Industry= F(oil price, GDP)	5,1,3	-0.331*	0.034* oil price 1.546* GDP
European			
GDP= F(oil price, industry)	5,1,3	-0.104*	0.5468*** Industry -0.022 oil price
Latin America			
GDP= F(oil price, industry)	5,1,3	-0.343*	0.145* oil price 0.860* industry
South Asia			
GDP= F(oil price, industry)	5,1,3	-0.401*	0.968* industry 0.006 oil price
Industry= F(oil price, GDP)	5,1,3	-0.617*	0.974* GDP - 0.003 oil price
Sub Saharan Africa			
Industry= F(oil price, GDP)	5,1,3	-0.102*	0.7087* GDP 0.025 oil price

Chapter 7

CONCLUSION

7.1 Aim and Summary of Findings

This thesis investigated the long-run equilibrium relationship between gross domestic product (GDP), crude oil prices, and industrial production in some regions countries that includes Euro Area, European Union, Latin America and Caribbean, South Asia, and Sub-Saharan Africa. Various econometric methods like unit root test and Zivot-Andrews test for stationary, bounds test for long-run relationship, error correction models for short term and long term dynamic have been applied to a data between 1973 and 2010.

Unit root tests and Zivot-Andrews test indicated that variables are integrated of mixed order. Bounds test implies long-run equilibrium relationship and error correction model present short run and long run relationship between dependent variable and independent variables. The main aim of this thesis was to estimate interactions between business conditions, economic growth, and crude oil prices in five regions countries.

Results of this study reveal that a long-run relationship exists between GDP with industry and oil prices in the case of Euro Area. It means that GDP converge to its long-run equilibrium level by 23.8 percent by the contribution of industry and oil prices while GDP was dependent variable and oil prices and industry were regressors in this area.

However, there is a long-run relationship between industry with GDP and oil prices in the case of Euro Area. It shows that industry converge to its long-run equilibrium level by 33.1 percent by the contribution of GDP and oil prices while industry was dependent variable and oil prices and GDP were regressors in this area.

There is a long-run relationship between GDP and industry in the case of European countries. It shows that GDP converge to its long-run equilibrium level by 10.4 percent by the contribution of industry while GDP was dependent variable and oil prices and industry were regressors in this area.

Results of this thesis have shown that a long-run relationship exists between GDP with oil prices and industry in the case of Latin America and Caribbean. It means that GDP converge to its long-run equilibrium level by 34.3 percent by the contribution of industry and oil prices while GDP was dependent variable and oil prices and industry were regressors in this area.

There is a long-run relationship between GDP and industry in the case of South Asia. It implies that GDP converge to its long-run equilibrium level by 40.1 percent by the contribution of industry while GDP was dependent variable and oil prices and industry were regressors in this area. However, a long-run relationship exists between GDP and industry in the case of South Asia. It means that industry converge to its long-run equilibrium level by 61.7 percent by the contribution of GDP while industry was dependent variable and oil prices and GDP were regressors in this area.

Results of this thesis have shown that a long-run relationship exists between GDP and industry in the case of Sub-Saharan Africa. It means that industry converge to its long-run equilibrium level by 10.2 percent by the contribution of GDP while Industry was dependent variable and oil prices and GDP were regressors in this area.

7.2 Policy Implications

This thesis has validated a long-run equilibrium relationship between business conditions, economic growth, and crude oil prices in five regions countries.

Euro Area and European countries as a part of importer oil countries should try that will be independent of oil and oil productions; because, there are sanctions for exporter countries; however, oil as a important product has been experienced more swings; but, they are one of industry hub in the world. Therefore, they can promote and provide their industry and industrial production which has direct effects on their business conditions and their economic growth.

Latin America and Caribbean has a situation in the world, now. It is a oil exporter and is second in industry level in the world. It can keep its position with improvement in monetary policy and can be better with empowering to quantitative techniques.

South Asia and Sub-Saharan Africa are importer oil regions; therefore they are rely to their industry. Government should be provides special business conditions and increases quality of its products and services. However, they should employ expert labor force and boost more skills in their labor force.

7.3 Shortcomings of the Study and Future Research

This thesis has employed five regions of eight regions for all income level from 1973 to 2010. This study could not employ all regions because part of data was not available for them. Further research can use developing sections in those regions, too. However, further research can analyze more years for all regions. Similar studies can be done for other countries and for other factors like macroeconomic or microeconomic factors or both of them. Finally, further research can be applied in another kind of tests in economic or finance for comparison purposes.

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