Effect of Oil Price Shocks on Ugandan Economy

By

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2015/PhD/022

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A PhD Proposal submitted in fulfillment of the requirements for the award of Doctor of Philosophy in Economics of Mbarara University of Science and Technology (MUST) in partnership with Uganda Technology and Management University (UTAMU)

April, 2017

DECLARATION

(i) Student

I declare to the best of my knowledge that this study is original and has not been submitted for any other degree award to any other University before.

Signed……………………………

Ogwang Geoffrey

Date :……………………………

(ii) Supervisor

This proposal has been submitted for examination with my approval as a supervisor.

Signed……………………………

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

This study explores the effect of oil price shocks on Ugandan economy. In studying the effect of oil price shocks on Ugandan economy, the movement of Real Gross Domestic Product (GDP), Inflation, Unemployment and Net Official Development Assistance for Uganda as a result of world oil price shocks will be investigated. It will further analyse the determinants of oil imports in Uganda.

The proposal is arranged into three chapters as follows: Chapter one is the introduction with ten sub-sections. Chapter two is the literature review exploring the existing literature on oil price shocks and economic growth including the existing gaps. Chapter three is the methodology with five sub-sections.

1.2 Background

The relationship between oil price shocks and economic activity has become a centre of interest to many researchers around the world and the recent decline of oil prices has even amplified the interest of many scholars in this area. Theoretically, oil price shocks should affect oil exporting and oil importing countries differently both at macroeconomic and microeconomic levels. The literature, however, has not reached a consensus on how oil price shocks affect the economy, or by how much (Wu & Cavallo, 2011).

The trend in oil price shock studies over the years has revealed expansion in the scope and coverage of oil price shock activities. However, economic fundamentals (demand and supply dynamics) remain the most fundamental channel of movements in the world oil price in addition to new discoveries and exploration breakthrough (Abiona, 2015).

According to World Bank (2015), oil prices feed into growth and inflation mainly through three channels namely:

*Input costs.*Lower oil prices reduce energy costs generally, as prices of competing energy materials are forced down too, and oil-fired electrical power is cheaper to produce. In addition, since oil is feedstock for various sectors, including petrochemicals, paper, and aluminum, the decline in price directly impacts a wide range of processed or semi-processed inputs. The transportation, petrochemicals, and agricultural sectors, and some manufacturing industries, would be major beneficiaries from lower prices.

*Real income shifts.*Oil price declines generate changes in real income benefiting oil-importers and losses hurting oil-exporters. The shift in income from oil exporting economies with higher average saving rates to net importers with a higher propensity to spend should generally result in stronger global demand over the medium-term. However, the effects could vary significantly across countries and over time: some exporting economies may be forced by financial constraints to adjust both government spending and imports abruptly in the short-term, while benefits for importing countries could be diffuse and offset by higher precautionary savings if confidence in recovery remains low.

Monetary and fiscal policies. In oil-importing countries where declining oil prices may reduce medium-term inflation expectations below target, central banks could respond with additional monetary policy loosening, which, in turn, can support growth. The combination of lower inflation and higher output implies a favorable short-run policy outcome.

These channels operate with different strengths and lags across countries.

Hamilton (1983) is known as the pioneer oil price macroeconomic relationship paper in the literature. He notes that all but one of the U.S. recessions since World War II have been preceded, typically with a lag of around three-fourths of a year, by a dramatic increase in the price of crude petroleum.

After criticism of Hamilton's (1983)linear impact model, an alternative analysis of oil price transformation that brought asymmetries into the transmission models of oil price shocks was introduced such as work of Mork (1989) and Hamilton (1996). However, the asymmetric transmission view was also later challenged by researchers such as Kilian (2009), Tang, Wu, & Zhang (2009), Ekong & Effiong (2015).

Suleman (2013) investigated the co-movements and causality relationship between oil prices and GDP of non-OECD countries, grouped depending on whether a country is a net oil exporter or net oil importer using both time series and panel data models. The result suggest that there is a long-run co-integrating relationship between oil prices and GDP and that oil prices 'Granger-causes' GDP for the group of net oil exporting countries but fails to 'Granger-cause' GDP for the net oil importing countries. This implies that oil prices have a strong influence on economic output of net oil exporting countries with little or no influence on the economic output of net oil importing countries (Suleman, 2013).Generally, researchers have shown that oil affect countries economic growth differently.

Unfortunately most of the research on the effects of oil price shocks and economic activity has been focusing on the developed economies. There are very few if any, known empirical studies on the oil price shocks and economic growth of Uganda. Given the potential of Uganda in the East African region economic development, understanding the behavior of her economy in relation to oil price shocks is very vital.

According to World Bank (2016b), starting in the late 1980s, the Uganda government has pursued a series of stabilization and pro-market structural reforms. The resultant macroeconomic stability, post-conflict rebound, and investment response generated a sustained period of high growth during 1987-2010. Real gross domestic product (GDP) growth averaged 7% per year in the 1990s and the 2000s, placing Uganda among the 15 fastest growing economies in the World. However, over the past decade (2006-2016), the country witnessed more economic volatility and the growth in gross domestic product (GDP) slowed to an average of just about 5% attributed toa number of risks, key among them, failure of the planned heavy public investment program. Other key risks include a larger global economic disturbance than has been projected and regional instability especially in South Sudan and the Democratic Republic of Congo, as well as unanticipated weather and climate related changes. Other macroeconomic risks comprise of currency depreciation, inflation, and high interest rates (World Bank, 2016b). However, according to CIA (2016), oil revenues and taxes in Uganda are expected to become a larger source of government funding as production starts in the next five to 10 years though lower oil prices may prove a stumbling block to further exploration and development. Petroleum product prices in Uganda were deregulated in 1994. Deregulation stimulated investment in the industry much as the pump prices remain high (MoEMD, 2002).

In this study fluctuations in the real price of oil will be attributed to three structural shocks: a) global supply of crude oil (henceforth "oil supply-side shock"); b) shocks to global demand for industrial commodities (including crude oil) that are driven by global real economic activity ("aggregate demand shock"); c) denotes an oil-market specific demand shock (shifts in precautionary demand for crude oil that reflect increased concerns about the availability of future oil supplies that are by construction orthogonal to the other shocks ("oil-specific demand shock") (Kilian, 2009). Oil supply shocks will be measured inform of changes in world oil production, oil aggregate demand shocks shall be measured inform of global economic activity while oil specific demand shock will be measured inform of changes in oil prices. All the data will be from secondary sources. Unlike other previous studies which used Kilian (2009) method of measuring global economic activities by utilising dry cargo single voyage freight rates for bulk dry cargoes including grain, oilseeds, coal, iron ore, fertilizer, and scrap metal, compiled by Drewry Shipping Consultants Ltd, this study will adopt measurement of the global economic activity based on world crude steel production data from World Steel Association. World steel production is proven to be one the best monthly indicators of global economic activity compared to other existing indicators, precisely the Kilian's index of global real economic activity and the index of OECD World industrial production (Ravazzolo & Vespignani, 2015).

The study will therefore contribute to the body of knowledge in oil and economic growth.

1.3 Statement of the Problem

Effect of oil price shock on macroeconomic variables has drawn extensive attention in energy economics over the past decades (Abiona, 2015). Since oil and its derivatives are the most traded commodities amongst economies, shocks to oil prices can have important effects on economic growth and other macroeconomic variables of oil exporting and importing countries (Huseynov, 2015). Kilian's (2009) work show that the origin and impact of oil price shocks depends on the underlying source of oil demand and oil supply shocks in the crude oil market.

The world crude prices has been declining since 2014, reaching record low, averaging $30 in the first two months of the year in 2016 (World Bank , 2016a). The other oil price declines of similar magnitude were recorded in 1986, when OPEC members partly reversed previous production cuts, and in 2008–09 during the early stages of the global financial crisis(Husain et al., 2015). Numerous studies have been conducted on effect of oil price shocks on developed economies such as Park & Ratti, (2008) on US and 13 European economies; Gao et al. (2014) on US economy; Kilian & Park (2009) on US economy; Jiménez-Rodríguez & Sánchez (2009) on Japanese economy; Gómez-Loscos, Montañés, & Gadea (2011) on Spanish economy; Broadstock, Cao, & Zhang (2012) on China; Degiannakis, Filis, & Kizys (2014) on European countries.

The Energy Policy for Uganda published in 2002and National Oil and Gas Policy for Uganda published in 2008 observe that the energy sector is directly linked to other sectors of the economy, providing their life-blood. However, there are no known empirical studies, if any, on how world oil price shocks affect the Ugandan economy utilizing the transmission channels.

1.4 General Objective

To determine the effect of oil price shocks on Ugandan economy.

1.5 Specific Objectives

i) To investigate the pass-through effect of oil price shocks to the local commodities' prices

ii) To determine the effect of oil price shocks on official development assistance received by Uganda

iii) To investigate the determinants of oil imports in Uganda

1.6 Research Questions

i) Is there any pass-through effect of oil price shocks to the local commodities' prices in Uganda?

ii) What are the effects of oil price shocks on official development assistance received by Uganda?

iii) What are the key determinants of oil imports in Uganda?

1.7 Conceptual Framework

Determinants of Oil Imports

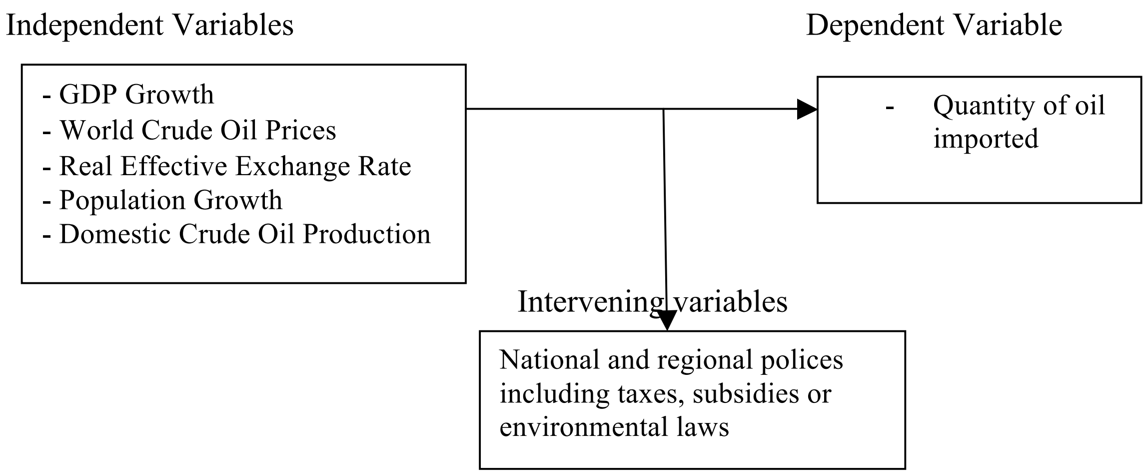

Figure 1: Determinants of Oil Imports

Source: Adopted and modifiedfrom Marbuah (2014)

As shown in figure 1, quantity of oil imported is determined by GDP growth, world crude oil prices, real effective exchange rate (REER), and domestic crude oil production and population growth. Factors such as national and regional policies on tax, subsidies and environmental laws are cited as intervening variables in the demand of oil imports. The level of economic growth generally influences oil demand and oil prices. This is because transportation activities require huge amounts of oil and are directly related to economic conditions. Manufacturing processes also consume a lot of oil as fuel or use it as feedstock, power generation to mention but a few.

Standard demand theory posts a negative relationship between quantity demanded and the price of a good, thus, it is expected that a higher price of crude oil will dampen demand for crude oil, ceteris paribus (Marbuah, 2014).The inclusion of real effective exchange rate in the demand equation is important because oil price on the world market is quoted in US dollars. Further, any change in the exchange rate of the local currency against the US$ affect the domestic price of oil and the real value of financial assets/wealth and hence the demand for oil (Marbuah, 2014). Domestic crude oil production is expected to influence how much oil is imported in to a given country depending on keys issues such as whether oil is refined in a given country, taxes levied on oil products as well as subsidies if any on oil product. Population growth is expected to increase national energy consumption through per capita consumption in key areas such as transportation.

Transmission channels of world oil-price shocks

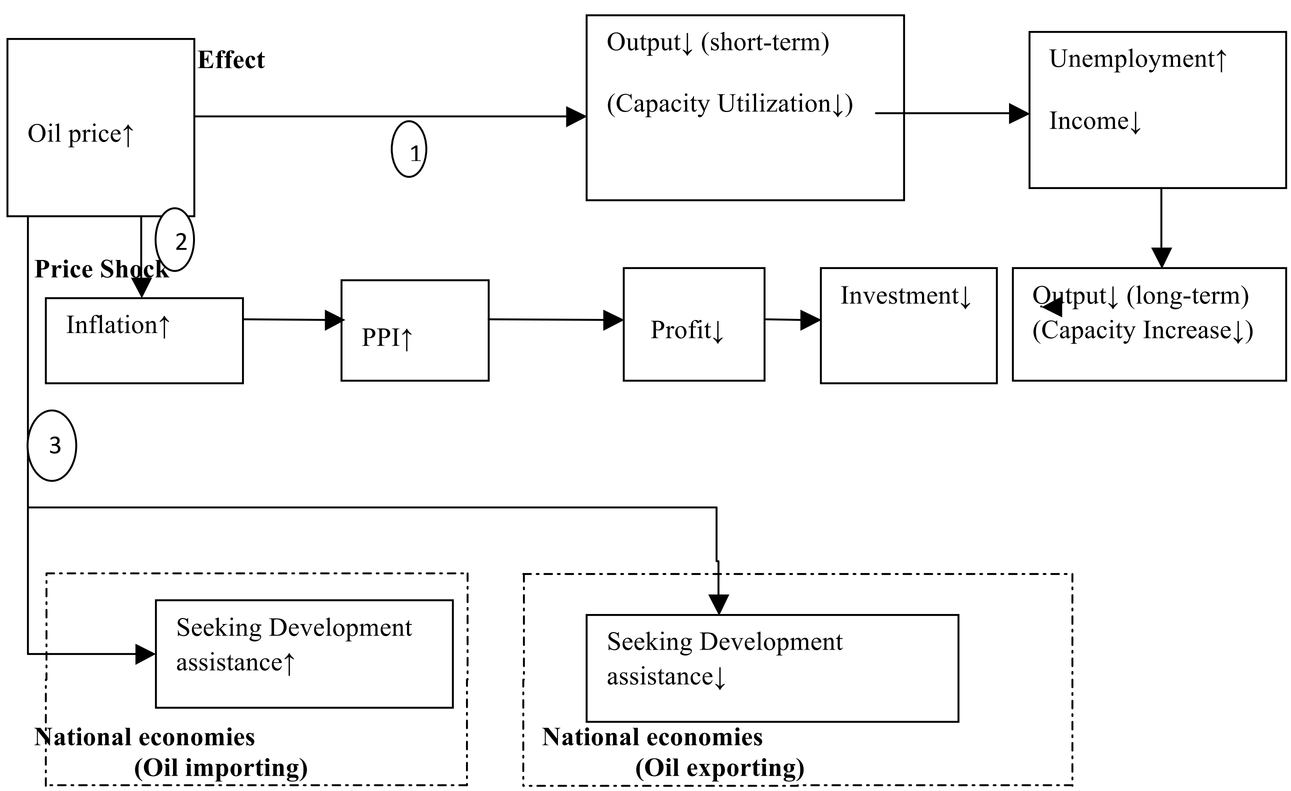

Figure 2: Transmission channels of world oil-price shocks

Source: Adopted and modified from Tang, Wu, & Zhang (2010)

The conceptual framework in figure 2shows how oil price shocks can affect the economic activity both in short and long run. In particular, oil price rise increases the unemployment and inflation while reducing the output and income. The effects of oil price shocks are thought also to influence official development assistance received by developing economies such as Uganda.

Arrow 1 indicates that oil-price shocks can increase the marginal cost of production in many industries, and thus reduce the production. This is referred to as the supply-side shock effect. The reduction of output due to the cut in capacity utilization can recover quickly within the range of capacity. However, oil-price shocks also have long-term effect on output which is carried out through Price/Monetary Transmission Mechanism as shown by arrow 2. When the observed inflation is caused by cost shocks including oil-price increases, a tight monetary policy can worsen the long-term output by increased interest rate and decreased investment (Tang et al., 2010).

Arrow 3 indicates a new addition to the work of Tang et al. (2010) by the researcher where oil price increases is seen to affect the output of developing economies with oil exporting countries seeking “less” development assistance as a result of vast revenues from high oil prices while oil importing countries seek “more” development assistance to provide cheaper social services at household levels. It is further noted that during period of low prices, oil exporting developing countries are desperately seeking for more development assistance for its allies to cover the deficit in budgets. According to Arezki & Banerjee(2014), foreign aid has long been a sizable source of funding for developing economies. In 2012, major donors disbursed $127 billion, two-thirds of it to low-income countries in Africa and Asia. In recent years, however, many developing economies, especially in sub-Saharan Africa including Uganda, have found a new source of home grown wealth that offers the same type of budgetary assistance as development aid with none of the strings that donor countries often attach to how it can be used or reforms countries must make to continue receiving it. Across Africa, discoveries of large oil fields are changing the financial picture for many developing economies (Arezki & Banerjee, 2014).

1.8 Significance of the Study

Increase or decrease in oil prices, and oil shocks in general, is one of the most important issues discussed in economic circles, because these oil shocks have always influenced the planning and implementation of economic and developmental policies (Kang & Ratti, 2013).

In recent years, many developing economies, some of them are major aid recipients have discovered vast amounts of gas and oil. Although there have been some important finds in South Asia and Latin America, the discoveries have been largely in sub-Saharan Africa (Arezki & Banerjee, 2014).More discoveries are being made for example in Uganda and Kenya and these countries are expected to be oil exporters in a near future. However, global crude oil prices have been declining since 2014 and have shown little recovery. Regrettably, there exists a huge gap in the literature on the impact of world crude oil price shocks on Ugandan economy and yet oil as an input drives all sectors of the economy. This study is therefore very valuable as it will narrow the gap in the literature on effect of oil price shocks on Ugandan economy and will further more aid in understanding the determinants of oil imports in Uganda. The finding of this study will assist in the management of Ugandan economy and recent oil resources discovered in Uganda.

The study will also employ a more recent thinking among economist which recognizes that the origin and impact of oil price shocks depends on the underlying source of oil demand and oil supply shocks in the crude oil-market.

1.9 Scope of the Study (geographical, time and content scope)

Geographical

The study will focus on the Uganda.

Time

The study will focus on annual data from 1992 to 2015.

Content scope

The study will focus on the effects of world oil price shocks on Uganda economy. The economic variables to be investigated will be limited to oil price shocks, real GDP growth, inflation, unemployment and net official development assistance received. It will also look at the determinants of oil imports for Uganda.

1.10 Operational Definitions

Oil Price Shock: Oil price shocks in this study will be broken down into three (3) forms: oil supply shocks; oil aggregate demand shocks; and oil specific demand shocks. Oil supply shocks will be measured inform of changes in world oil production, oil aggregate demand shocks shall be measured inform of global economic activity while oil specific demand shock will be measured inform of changes in oil prices.

Official Development Assistance received: Net official development assistance (ODA) consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent).

Unemployment: Unemployment refers to the share of the labor force that is without work but available for and seeking employment.

Upstream Oil and Gas Activities: Related activities and expenditures in oil and gas extraction, including exploration, leasing, permitting, drilling, completion, and long-term well operation.

Midstream Oil and Gas Activities: Related activities and expenditures downstream of the wellhead, including gathering, gas and liquids processing, and pipeline transportation of the oil and gas.

Local commodities prices: Five (5) categories of CPI sub-indices that include: Food and Beverages, Housing, Apparel, Medical Care and Transportations.

Downstream Oil and Gas Activities: Related activities and expenditures in the areas of refining, distribution, and retailing of oil and natural gas products in the market.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents various studies conducted in relation to determinants of oil imports, oil price shocks and economic growth. This chapter also identifies the gaps in the existing studies and presents the rationale for conducting this study.

2.2 Review of Economic Growth Models

According to Abdalla & Abdelbaki (2014), the issue of determinants of economic growth is long debated in literature at both theoretical and empirical levels. The discussion starts with the classical theory of Adam Smith and goes to neoclassical Solow model which emphasize the role of labor, capital, and technology in economic growth. Empirical studies, on the other hand, have investigated a wide range of factors that determine economic growth. Using different methodology and conceptual framework, these studies identified a considerable number of factors affecting economic growth (Abdalla & Abdelbaki, 2014).

2.2.1 Endogenous growth theory

The endogenous growth theory is an economic theory which argues that economic growth is generated from within a system as a direct result of internal processes. More specifically, the theory notes that the enhancement of a nation's human capital will lead to economic growth by means of the development of new forms of technology and efficient and effective means of production. This view contrasts with neoclassical economics, which contends that technological progression and other external factors are the main sources of economic growth. Supporters of endogenous growth theory argue that the productivity and economies of today's industrialized countries compared to the same countries in pre-industrialized eras are evidence that growth was created and sustained from within the country and not through trade (Investopedia, 2017).

2.2.2 Exogenous Growth theory

Exogenous growth is the belief that economic growth arises due to influences outside the economy or company of interest. Exogenous growth assumes that economic prosperity is primarily determined by external rather than internal factors. According to this belief, given a fixed amount of labor and static technology, economic growth will cease at some point, as ongoing production reaches a state of equilibrium based on internal demand factors.

The concept of exogenous growth grew out of the neoclassical growth model and the works contributed by Robert Solow. The exogenous growth model factors in production, diminishing returns of capital and technological variables to determine economic growth (Investopedia, 2017).

2.2.3 Classical growth theory

Classical economists from Adam Smith to Marshall attributed higher rates of economic growth mainly to the capital accumulation. New and better equipment raise productivity of workers by improving the technology of production. Higher rates of saving and investment allow more accumulation of capital and generate higher rates of economic growth. They believed in general equilibrium mechanism of economic growth and thought that increase in productivity automatically translates into an increase in the wage rate (Bhattarai, 2004).

2.2.4 The Neoclassical Growth Theory: Market Fundamentalism

According to Todaro & Smith (2012), in the 1980s, the political ascendancy of conservative governments in the United States, Canada, Britain, and West Germany came with a neoclassical counter- revolution in economic theory and policy. In developed nations, this counter- revolution favored supply-side macroeconomic policies, rational expectations theories, and the privatization of public corporations. In developing countries, it called for freer markets and the dismantling of public ownership, statist planning, and government regulation of economic activities.

2.3Oil Price Shocks and Economic Growth

Theoretically, several researchers have offered a number of explanations for relationship between oil price changes and economic activities. According to Jiménez-Rodriguez & Sánchez (2004), the transmission mechanisms through which oil prices have an impact on real economic activity include both supply and demand channels. The supply side effects are related to the fact that crude oil is a basic input to production, and consequently an increase in oil price leads to a rise in production costs that induces firms to lower output. Oil prices changes also entail demand-side effects on consumption and investment. Consumption is affected indirectly through its positive relation with disposable income. The magnitude of this effect is in turn stronger the more the shock is perceived to be long-lasting. Moreover, oil prices have an adverse impact on investment by increasing firms' costs (Jiménez-Rodriguez & Sánchez, 2004).

The literature on oil markets and on the transmission of oil price shocks has made more progress than would have seemed possible 15 years ago. Some of the key insights are that the real price of oil is endogenous with respect to economic fundamentals, and that oil price shocks do not occur ceteris paribus, making it necessary to account for the deeper structural shocks underlying oil price shocks when studying their transmission to the domestic economy (Kilian, 2014).

The decline in oil prices will lead to significant real income shifts from oil exporters to oil importers, likely resulting in a net positive effect for global activity over the medium term. While the positive impact for oil importers could be more diffuse and take some time to materialize, the negative impact on exporters is immediate and in some cases accentuated by financial market pressures. While the positive impact for oil importers could be more diffuse and take some time to materialize, the negative impact on exporters is immediate and in some cases accentuated by financial market pressures (Baffes, Kose, Ohnsorge, & Stocker, 2015).

The approach that will be used to determine the effects of oil price shocks on Uganda will follow the work of Kilian (2009). The study will involve use of structural vector autoregressive model (SVAR).

Appendix 2:Selected previous studies on oil price shocks and economic growth

2.4 Selected Previous World Oil Price Shocks

According to Hamilton (2011), there has been numerous world oil price shocks in the history which include; Postwar dislocations (1947-1948), Supply disruptions and the Korean conflict (1952-1953), Suez Crisis (1956-1957), Modest price increases (1969-1970), OPEC Embargo (1973-1974), Iranian revolution (1978-1979), Iran-Iraq War (1980-1981), The great price collapse (1981-1986), First Persian Gulf War (1990-1991), East Asian Crisis (1997-1998), Resumed growth (1999-2000), Venezuelan unrest and the second Persian Gulf War (2003) and Growing demand and stagnant supply (2007-2008). Whereas previous oil price shocks were primarily caused by physical disruptions of supply, the price run-up of 2007–08 was caused by strong demand confronting stagnating world production (Hamilton, 2007).

2.5Determinants of Oil Imports

According to Marbuah (2014), there are a number of empirical studies on energy demand in developed, emerging, and developing countries. Studies on the demand for crude oil have seen significant growth in recent years (Marbuah, 2014). According to a study by Yaprakli & Kaplan (2015) that examined the Turkish crude oil import demand for the period of 1970-2013, the empirical results show that income and price elasticities of demand for crude oil import in the long-run are inelastic. Yeboah & Joseph (2015) examined the long run and short run determinants of fossil fuel consumption in Ghana for 1970-2011 period by using Autoregressive distributed lag model (ARDL). The results suggested that macroeconomic variables such as income, price, trade openness, investment, money supply, and government expenditure do not play observable role in fossil fuel consumption hence they could not be relied on as a policy tool to manage fossil fuel consumption. The study will be based on ARDL modelling approach by of Pesaran, Shin, & Smyth, (2001)and a study by Marbuah (2014) who investigated oil import demand in Ghana using the autoregressive distributed lag modelling framework (ARDL). The results of the study by Marbuah (2014)show that demand for crude oil is price inelastic in both the long and short term. Other important drivers of crude oil import are the real effective exchange rate, domestic crude oil production and population growth. Furthermore, real economic activity is found to be the most robust and dominant driver of crude oil demand with mixed estimates of inelastic and elastic coefficients in the short-run and long-run, respectively (Marbuah, 2014).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the proposed methodology for the study. It includes the research design and model specification, data sources, model specification and data analysis technique that will be used in the study.

3.2 Research Design

Research design is the overall plan for connecting the conceptual research problems to the pertinent empirical research. The study will be a causal research. Causal research differs in its attempt to explain the cause and effect relationship between variables.

3.3 Study Population, Sample and Sampling Technique

Purposive sampling was used to select Uganda. Uganda was chosen because of its recent economic transformation strategies including plan to be a middle income country by 2020. In addition, Uganda has also discovered oil recently and therefore oil and in particular oil price shocks will play a significant role in its economic management policies in years to come.

3.4 Data Sources

Table 1: Data Sources

No	Data type	Source
1	World oil production (tonnes)	BP statistical review of World Energy 2016
2	Oil price (U.S. Crude Oil Imported Acquisition Cost by Refiners in Dollars per Barrel)	US Energy Information Administration
3	World crude steel production (Measure of global economic activity)	World Steel Association
4	Real GDP (National currency)	International Monetary Fund, World Economic Outlook Database, 2016
5	Consumer Price Index	Bank of Uganda
6	Unemployment (% total of labour force)	World Bank database: World Development Indicators, 2016
7	Net Official Development Assistance received (constant 2013 US$)	World Bank database: World Development Indicators, 2016
8	Crude oil import for Uganda (US$ million)	International Monetary Fund, World Economic Outlook Database, 2016
9	Population growth for Uganda	World Bank database: World Development Indicators, 2016
10	Real Effective Exchange Rate (REER)	International Monetary Fund, World Economic Outlook Database, 2016

The data that will be considered will range from 1992 to 2015.

3.5 Model Specification and Application

3.5.1 Objective (i)

The methodology will be based on ARDL modelling approach by Pesaran et al. (2001)and a study by Marbuah (2014) who investigated oil import demand in Ghana using the autoregressive distributed lag modelling framework (ARDL). Following from the standard framework of modelling energy demand which is derived from the Marshallian demand theory for goods and services, the study will formulatebasic crude oil import demand model, consistent with the literature, as a function of real income and international price of crude oil. The study will also include other two variables (Population growth and Real Effective Exchange Rate) which are equally important.

The model for this study will be in the form of;

$$OI_t = f\,(OP_t, GDP_t, REERt, PG_t) \quad \ldots\ldots (1)$$

Where OIt denote the value of crude oil import for Uganda in US$ million, GDPt is the value of real economic activity (proxied by real GDP of Uganda in constant prices and in US$ million). Crude oil price, OPt, is the world oil price with UK Brent as the reference and deflated by the world consumer price index to obtain oil price in real terms. REERt is the real effective exchange rate, while PGt is the population growth rate for Uganda.

The inclusion of REER in the demand equation is vital since oil price on the world market is quoted in US dollars. In addition, any change in the exchange rate of the local currency against the US$ affect the domestic price of oil and the real value of wealth and thus the demand for oil. Since Uganda is generally a net importer of crude oil and a price-taker, any changes in the exchange rate will influence demand for crude. The REER variable is defined such that an increase implies real appreciation of Uganda's currency against the US$. Therefore, real appreciation of the local currency against the US$ should kindle aggregate demand and hence a higher demand for crude oil.

Equation (1) is expressed in logarithmic form as follows:

$$OI_t = \alpha_0 + \alpha_1 \ln OP + \alpha_2 \ln GDP + \alpha_3 \ln REER + \alpha_4 \ln PG + \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

While estimating the short-run and long-run determinants of crude oil import demand, the study shall use the Autoregressive Distributed Lag (ARDL)modelling approach by Pesaran, Shin, & Smyth (2001).

This modelling approach will involve estimating a dynamic model by incorporating the lags of the dependent variables as well as the lagged and contemporaneous values of the independent variables. The short-run components will be estimated directly while the long-run effects shall be obtained indirectly. The study shall utilize the bounds test for cointegration analysis within the ARDL framework. The benefit of using ARDL modelling over other cointegration is that it has superior finite sample properties unlike the Engle and Granger two-step and Johansen maximum likelihood approaches which suffer from small sample bias. In addition, it can be useful irrespective of the order of integration of the series under consideration.

Much as ARDL does not require pre-testing of the variables for unit root, the study will determine the presence or otherwise of higher order integrated series such as I(2) which can annul the modelling process. The study shall implement the ARDL approach in two main steps. Before estimating the short-run and long-run elasticities, the study will first test for cointegration to establish if there is any long-run equilibrium relationship among the variables in the model to be estimated. Incase cointegration is recognized, the study will then estimate the long-run coefficients and the associated short-run parameters using the ARDL framework.

Cointegration among the variables is confirmed within the bounds test framework by testing the joint null hypothesis that the coefficients of the lagged level variables are significantly zero. It is an F-test with a non-standard asymptotic distribution which is dependent on whether the included variables in the ARDL model are either I(0) or I(1), number of regressors, whether an intercept and/or a trend is included in the ARDL model, and the sample size (Pesaran et al., 2001)then provides two sets of critical values in testing for cointegration when the underlying variables are I(1) or I(0). If the calculated F-statistic exceeds the upper critical bound at some significance level, then we can safely reject the null hypothesis of no cointegration. Conversely, if the calculated F-statistics falls below the lower critical bound, we fail to reject the null of no cointegration. If it however falls within the band, then our inference is inconclusive.

3.5.2 Objectives (ii)& (iii)

(a) SVAR I – Aggregate Oil Market

The essential plan is to untangle the oil price from demand and supply forces and therefore this first SVAR will determine the relationship between the oil production, global economic activity and the oil price following the work of Kilian (2012).Shocks in the real price of oil will be attributed to three structural shocks: a) global supply of crude oil (henceforth “oil supply-side shock”); b) shocks to global demand for industrial commodities (including crude oil) that are driven by global real economic activity (“aggregate demand shock”); c) denotes an oil-market specific demand shock (shifts in precautionary demand for crude oil that reflect increased concerns about the availability of future oil supplies that are by construction orthogonal to the other shocks ("oil-specific demand shock") (Kilian, 2009).It should thereof be noted that the first SVAR will determine if shocks in these two key variables (world oil production and global economic activity) have significant effect on the oil price. The study will also adopt measurement of the global economic activity based on world crude steel production data from World Steel association recently developed by Ravazzolo & Vespignani (2015) unlike in the work of Kilian. A VAR is an n-equation, n-variable model in which each variable is in turn explained by its own lagged values, plus (current) and past values of the remaining n-1 variables.

Following Kumah & Matovu (2005), the general form of time series characteristic of a structural VAR model can be expressed as follows;

$X_t=\mu+\rho X_{t-1}+\delta Trend_t+\xi_1\Delta X_{t-1}+\xi 2\Delta X_{t-2}+....+\xi_{\rho}-_{-\ell}\Delta X_{t\rho}-_{-\ell}+\varepsilon_t$………………………… (3)

Where; μ, ρ, δ and $\xi 1$, $\xi 2$.....and $\xi_{\rho}-_{-\ell}$ are coefficients. Residual (ε_t) is independent and identically distributed (iid) with zero mean and variance equal to σ^2.

Consider a VAR model consisting of monthly data for Z_t = ($OPRD_t$,GEA_t, ROP_t) where OPRD is first difference of world oil production and is equivalent to oil supply side shocks, GEA is first difference of global economic activity and is equivalent to oil aggregate demand shocks, ROP is first difference of real oil price and is equivalent to oil specific demand shocks. All the variables are in logs. The data to be considered is from 1992 to 2015.

Following Kilian (2009), the SVAR representation of the model consisting of a vector of serially and mutually uncorrelated structural innovations, ε_t is shown in equation (4)

$A_0 Z_t = c_0 + \sum_{i=1}^{3} A_i Z_{t-i} + \varepsilon_t$ ……………………………………………..(4)

The structural innovations will be generated by imposing exclusion restrictions on ${A_0}^{-1}$.

Fluctuation in real oil prices will be underpinned by three structural shocks explained below;

ε_{1t} = captures crude oil supply shock/oil production

ε_{2t} = captures aggregate demand shocks

ε_{3t} = captures demand shocks specific to the oil market

Assuming that Z_t will respond to shocks to each variable in the vector, additional restrictions will be imposed as explained below, yielding a recursively identified model with reduced form of error, e_t = ${A_0}^{-1}\varepsilon_t$. The number of restriction is based on the formula; $\frac{n^2-n}{2}$, where n is the number of variables. A VAR with three variables needs $\frac{3^2-3}{2}=3$ restrictions. The total number of known elements will be $\frac{n^2+n}{2}=\frac{3^2+3}{2}=6$. The zeros on the upper matrix in equation (5) are the restrictions.

Hence, it is postulated that ${A_0}^{-1}$ has a recursive structure such that the reduced form errors e_t can be decomposed according to e_t = ${A_0}^{-1}\varepsilon_t$. The study will adopt a Cholesky factorization in order to recover the vector of structural shocksε_t in equation (4).

$$\varepsilon_t = \begin{bmatrix} e_{1,t}^{\text{OPRD}} \\ e_{2,t}^{\text{GEA}} \\ e_{3,t}^{\text{ROP}} \end{bmatrix} = \begin{bmatrix} a_{1,1} & 0 & 0 \\ a_{2,1} & a_{2,2} & 0 \\ a_{3,1} & a_{3,2} & a_{3,3} \end{bmatrix} \text{x} \begin{bmatrix} \varepsilon_{1,t}^{oil\ supply\ shock} \\ \varepsilon_{2,t}^{aggregate\ demand\ shock} \\ \varepsilon_{3,t}^{oil\ specific\ demand\ shock} \end{bmatrix} \ldots\ldots\ldots\ldots.(5)$$

As in Kilian (2009), the Cholesky ordering in (5) is based on the following assumptions;

i) $a_{1,2}=0\ and\ a_{1,3}=0$, imposes the restrictions of no response from crude oil production to aggregate demand shocks and oil-specific demand shock, respectively, within the same month. This is on the assumption that there are high costs associated with an adjustment to oil production and as such an increase in the supply of crude oil is only expected to be significantly influenced by a persistent rise in demand. Such shocks are driven by oil production disruptions caused by military and political conflicts or adjustment in the production quota as determined by OPEC's monopoly of the crude oil markets.

ii) $a_{2,3} = 0$ which assumes that an increase in the real price of oil emanating from oil-specific demand shocks will not reduce global real economic activity within a month. The global real economic activity respond immediately to oil supply shocks while it reacts sluggishly that is more than a month to other oil-specific shocks.

iii) It is also assumed that innovations to the real price of oil that cannot be explained by oil supply shocks or aggregate demand shocks must be demand shocks that are specific to the oil market. Shocks to oil prices (oil-specific shocks) that are not driven by oil supply and aggregate demand shocks are explained by the precautionary motives for oil demand which is induced by uncertainty in the availability of future supply of crude oil.

(b) SVAR II – Effect of oil price shock on Ugandan economy

Firstly, the oil demand and supply shocks will be identified using a recursive (Cholesky) identification procedure. Once the oil market shocks are recovered from the first stage, it will be subjected to the macroeconomic variables within a VAR framework to assess their response pattern and the relative importance of each oil price shocks (including their cumulative effects) in explaining the fluctuations in the macroeconomic aggregates over time (Kilian, 2009).

Specifically;

SVAR model for oil price shock pass-through to the local commodities' prices (CPI) is represented by equation (6)

$$\varepsilon_t = \begin{bmatrix} e_{1,t}^{OPRD} \\ e_{2,t}^{GEA} \\ e_{3,t}^{ROP} \\ e_{4,t}^{CPI} \end{bmatrix} = \begin{bmatrix} a_{1,1} & 0 & 0 & 0 \\ a_{2,1} & a_{2,2} & 0 & 0 \\ a_{3,1} & a_{3,2} & a_{3,3} & 0 \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} \text{x} \begin{bmatrix} \varepsilon_{1,t}^{\text{oil supply shock}} \\ \varepsilon_{2,t}^{\text{oil aggregate demand shock}} \\ \varepsilon_{3,t}^{\text{oil specific demand shock}} \\ \varepsilon_{4,t}^{CPI-\text{shock}} \end{bmatrix} ..(6)$$

SVAR model for oil price shock pass-through to official development assistance (ODA) is represented by equation (7)

$$\varepsilon_t = \begin{bmatrix} e_{1,t}^{OPRD} \\ e_{2,t}^{GEA} \\ e_{3,t}^{ROP} \\ e_{4,t}^{ODA} \end{bmatrix} = \begin{bmatrix} a_{1,1} & 0 & 0 & 0 \\ a_{2,1} & a_{2,2} & 0 & 0 \\ a_{3,1} & a_{3,2} & a_{3,3} & 0 \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} \end{bmatrix} \text{x} \begin{bmatrix} \varepsilon_{1,t}^{\text{oil supply shock}} \\ \varepsilon_{2,t}^{\text{oil aggregate demand shock}} \\ \varepsilon_{3,t}^{\text{oil specific demand shock}} \\ \varepsilon_{4,t}^{ODA-\text{shock}} \end{bmatrix} ..(7)$$

Combined SVAR model for oil price shock pass-through to Ugandan economy is represented by equation (8)

$$\varepsilon_t = \begin{bmatrix} e_{1,t}^{OPRD} \\ e_{2,t}^{GEA} \\ e_{3,t}^{ROP} \\ e_{4,t}^{GDP} \\ e_{4,t}^{CPI} \\ e_{4,t}^{unemp} \\ e_{4,t}^{ODA} \end{bmatrix} = \begin{bmatrix} a_{1,1} & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{2,1} & a_{2,2} & 0 & 0 & 0 & 0 & 0 \\ a_{3,1} & a_{3,2} & a_{3,3} & 0 & 0 & 0 & 0 \\ a_{4,1} & a_{4,2} & a_{4,3} & a_{4,4} & 0 & 0 & 0 \\ a_{5,1} & a_{5,2} & 5_{3,3} & a_{5,4} & a_{5,5} & 0 & 0 \\ a_{6,1} & a_{6,2} & a_{6,3} & a_{6,4} & a_{6,5} & a_{6,6} & 0 \\ a_{7,1} & a_{7,2} & a_{7,3} & a_{7,4} & a_{7,5} & a_{7,6} & a_{7,7} \end{bmatrix} \text{x} \begin{bmatrix} \varepsilon_{1,t}^{\text{oil supply shock}} \\ \varepsilon_{2,t}^{\text{oil aggregate demand shock}} \\ \varepsilon_{3,t}^{\text{oil specific demand shock}} \\ \varepsilon_{4,t}^{GDP-\text{shock}} \\ \varepsilon_{4,t}^{CPI-\text{shock}} \\ \varepsilon_{4,t}^{unemp-\text{shock}} \\ \varepsilon_{4,t}^{ODA-\text{shock}} \end{bmatrix} ..(8)$$

Where *unemp* is the unemployment, *CPI* is the consumer price index (local commodities' prices), *GDP* is the Gross Domestic Product, *ODA* is the official development assistance received by Uganda.

This SVAR model follows a recursive ordering as in the first SVAR. The first three variables in the Cholesky ordering follow the same underlying principle in the first SVAR. The other variables have also been placed following the assumption of the author and economic theory.

3.6 Data Estimation Techniques

E-views software will be used in the analysis of data. A number of analyses will be carried out which includes; stationarity test, cointegration test, accumulated impulse responses and variance decomposition analysis.The annual data will be converted to quarterly and monthly data using E-veiws (cubic match average method).

3.6.1 Stationarity test

The stationarity of series y means, overtime y will have:

- Constant mean
- Constant covariance
- Co-variance between different observations do not depended on time (t) but only on the distance or lag between them (j)

The consequences of non-stationarity include:

- Shocks do not "die out"
- Non-normal distribution of test statistics, bias in autoregressive coefficients and poor forecast quality

The stationarity test in this study will use regressions of time series data analyzed against a constant. These regressions can be expressed as follows;

$Yt = \alpha + \beta.t + \varepsilon t$ ……………………………………………………………..(7)

$ndYi = \alpha + \beta.t + \sum_{i=1}^{n} \lambda.\, dY_{t-i} + \delta.Y_{t-i} + \varepsilon_t$ …………………………………(8)

The stationarity of residuals (ε_t) will be tested.

The first step in determining stationarity will involve graphing the data to observe its behaviour.

The next step will be conducting a unit root test. The series will be examined for stationarity using Augmented Dickey-Fuller (ADF) test. The null hypothesis of ADF is that the series has a unit root (non-stationary) and rejecting the null hypothesis of the ADF unit root test implies the series is stationary. Lag lengths (p) of the ADF (dY_{t-i}) will be selected using Akaike Information Criterion (AIC).

3.6.2 Cointegration Test

As in Odongo & Muwanga (2014), Johnsen test procedure will be adopted by this study to test for cointegrating relationship within endogenous variables based on Maximum Likelihood (LM) test and unrestricted Vector Auto Regression (VAR) test. Cointegration rank r (number of cointegrating vectors) will be tested using trace statistics and Maximum Eigen Statistics (MES). The trace statistics test null hypothesis that there are at most r cointegrating vectors against alternative of r or more cointegrating vectors, while the Maximum EigenStatistics test null hypothesis of r cointegrating vectors against alternative of r+1 cointegrating vectors.

3.6.3Accumulated Impulse response function

As in Odongo & Muwanga (2014), the accumulated impulse responses of endogenous variables will capture dynamic responses of endogenous variables due to one standard deviation in structural innovation. Restrictions will imposed on the structural coefficients which allow for a transformation process that uncovers shocks from the VAR system. This study will use the tabular form to present the results from the analysis.

3.6.4 Variance decomposition

Knowledge of forecast errors is useful in determining the relationship between variables. Variance decomposition will be used to give the proportion of the movement of a variable due to shocks to itself and to shocks to other variables. E-view will be used to generate variance decomposition for all the variables. The results of the variance decomposition will be interpreted once generated.

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5.0 APPENDICES

Appendix 1: Work plan and Timeframe

	Description of task	Milestone	Target date
1	Proposal development and defence	Successful defence of the proposal	August 2015 to July 2016 (12 months)
2	Data collection and analysis	Data analyzed successfully	August 2016 to April 2017 (9months)
3	Compilation of thesis and production of publishable papers	Thesis and papers ready for publication	May 2017 to October 2017 (5 months)
4	Review of the thesis, acceptance and award of the degree	Thesis accepted and award of the degree of Doctor of Philosophy (PhD)	November 2017 to July 2018 (8 months)

Appendix 2: Summary of selected previous studies on oil prices shocks

No	Authors & Year	Title	Model/Methodology	Result
1	Wiafe, Barnor, & Quaidoo (2014)	Oil price shocks and private investment in Ghana	Dynamic Ordinary Least Squares (DOLS) technique was used to estimate the effect of oil price on domestic investment in Ghana.	The analysis revealed that there is a long run relationship between domestic private investment, oil price shocks, exchange rate, inflation, income and credit to private sector. The study found negative effect of oil price shocks on investment.
2	Thierfelder (2007)	Economy wide and Distributional Impact of an Oil Price Shock on the South African Economy	Computable general equilibrium (CGE) Model	With respect to the distributional impact of these shocks, they found that aggregative poverty and income inequality measures do not vary a lot numerically. However, a look beyond these aggregate results, the adverse impact of the oil price shock was mostly felt by the poorer segment of the formal labor market in the form of declining wages and increased unemployment. Unemployment hit mostly low- and medium-skill workers in the tertiary sector, and about 70 percent of those workers belonged to the bottom three deciles of the formal labor force
3	Salehi-isfahani & Majbouri (2008)	The Effects of Oil Shocks on Poverty and Education in Iran: Evidence from the 1992-95 Panel	Regression on panel data	They showed that the shocks have strong effects on poverty and welfare of the poor and also affect enrollments in school. Although about 20 percent of the population is poor in any given year in that period, only 3 percent are poor for the entire panel period.
4	Yinka (2014)	Oil price shocks and Nigerian economic growth	General Methods of Moment (GMM) using data from 1981 to 2012	After appropriate robustness checks, the study found that oil price shocks insignificantly retards economic growth while

				oil price itself significantly improves it. The significant positive effect of oil price on economic growth confirms the conventional wisdom that oil price increase is beneficial to oil-exporting country like Nigeria. Shocks however create uncertainty and undermine effective fiscal management of crude oil revenue; hence the negative effect of oil price shocks.
5	Abeysinghe (2001)	Estimation of direct and indirect impact of oil price on GDP growth of 12 economies (Indonesia, Malaysia, Philippines, Thailand, Hong Kong, South Korea, Singapore, Taiwan, China, Japan, USA and Rest of OECD)	A structural VARX model	The direct impact of high oil prices on both Indonesia and Malaysia (net oil exporters) were positive. In the long run, they also lose out. This result would likely hold in general for oil exporting open economies. All the other economies they studied were net oil importers. Both direct and indirect effects on them were negative.
6	Cologni & Manera (2008)	Oil Prices, Inflation and Interest Rates for the G-7 Countries	A structural co-integrated VAR model	Empirical analysis showed that, for most of the countries considered, there seems to be an impact of unexpected oil price shocks on interest rates, suggesting a contractionary monetary policy response directed to fight inflation.
7	Degiannakis, Filis, & Kizys (2014)	The Effects of Oil Price Shocks on Stock Market Volatility: Evidence from	Structural VAR model	The findings suggested that supply-side shocks and oil specific demand shocks do not affect volatility, whereas, oil price changes due to aggregate demand shocks lead to a

		European Data		reduction in stock market volatility.
8	Berument, Ceylan, & Dogan, (2010)	The Impact of Oil Price Shocks on the Economic Growth of Selected MENA Countries	Vector Autoregressive	Their study suggested that oil price increases have a statistically significant and positive effect on the outputs of Algeria, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Syria, and the United Arab Emirates. However, oil price shocks do not appear to have a statistically significant effect on the outputs of Bahrain, Djibouti, Egypt, Israel, Jordan, Morocco, and Tunisia.
9	Broadstock, Cao, & Zhang (2012)	Oil Shocks and their Impact on Energy Related Stocks in China	Dynamic conditional correlation model	Their empirical results demonstrated that international oil price changes are correlated with energy related stock returns in the context of China, but in a time varying way. They argued that this reflects the fact that investors in the Chinese stock market, especially for energy related stocks, are more sensitive to the shocks in international crude oil market.
10	Dybczak, Voňka, & Windt (2007)	The Effect of Oil Price Shocks on the Czech Economy	Structural Computable General Equilibrium model	They quantified the impact of oil price changes on the Czech economy and demonstrated that it was not dramatic despite the oil price turmoil in the years 2000 to the end of 2007. They found that a 20% increase in the CZK oil price tends to decrease the GDP level by 1.5% and 0.8% in the short and long run, respectively. Short-run annual GDP growth decreases by 0.3 p.p.
11	Gao et al. (2014)	How Do Oil Price Shocks Affect Consumer Prices in U.S.?	Bivariate vector autoregressive (VAR) model	They found significantly positive effects of the oil price shock only on energy-intensive CPIs, which imply that significantly positive, though

				quantitatively small, response of the total CPI is mainly driven by substantial increases in prices of energy-related commodities. Unexpected changes in the oil price may result in decreases in the budget for non-energy commodities, if the demand for energy is inelastic.
12	Ghosh, Varvares, & Morley (2009)	The Effects of Oil Price Shocks on Output (US)	Dynamic error correction model	Their preferred model suggests that oil prices reduced GDP growth by about 0.4 percentage point on average through the first three quarters of 2008, before contributing 1.7 percentage points in the fourth quarter as prices plummeted.
13	Ghosh & Kanjilal (2014)	Oil price shocks on Indian economy: Evidence from Toda Yamamoto and Markov regime-switching VAR	Toda Yamamoto and Markov regime-switching VAR	Their study found that inflation and foreign exchange reserve are greatly impacted by oil price shocks. The study also confirmed that the movement in oil price is exogenous with respect to the movement of India's macroeconomic variables and the impact of oil price shocks are asymmetric in nature with negative price shocks having more pronounced effect than positive shocks.
14	Gómez-Loscos, Montañés, & Gadea (2011)	The impact of oil shocks on the Spanish economy	Bivariate VAR	Evidence in favour of a diminishing effect of oil price shocks on the output and inflation is found from the 1970s until the mid 1990s.
15	Gounder & Bartleet (2006)	Oil price shocks and economic growth: Evidence for New Zealand,	Vector Autoregressive	The results indicated that linear price change, the asymmetric price increase and the net oil price variables are significant for the system as a whole,

		1989-2006		whereas the asymmetric price decrease is not. Following the causality analysis of oil price-growth nexus, the generalized impulse responses and error variance decompositions reaffirm the direct link between the net oil price shock and growth, as well as the indirect linkages.
16	Jiménez-Rodriguez & Sánchez (2004)	Oil price shocks and real GDP growth empirical evidence for some OECD countries	Multivariate VAR analysis carried out using both linear and non-linear models	They found evidence of a non-linear impact of oil prices on real GDP. In particular, oil price increases were found to have an impact on GDP growth of a larger magnitude than that of oil price declines, with the latter being statistically insignificant in most cases. Among oil importing countries, oilprice increases were found to have a negative impact on economic activity in all cases but Japan. Moreover, the effect of oil shocks on GDP growth differs between the two oil exporting countries in their sample, with oil price increases affecting the UK negatively and Norway positively.
17	Jiménez-Rodríguez & Sánchez (2009)	Oil Price Shocks and Japanese Macroeconomic Developments	Vector autoregression model of order p, or simply, VAR(p)	Their main econometric results provided evidence of non-linear macroeconomic impacts stemming from oil prices. More specifically, the scaled model – one of the leading non-linear approaches were found to dominate all of its alternatives. The scaled model, by controlling for the time-varying conditional variability of oil prices, highlights the importance of considering not only the magnitude and direction of actual oil price

				changes, but also the context in which the latter occur.
18	Kilian & Park (2009)	The impact of oil price shocks on the U.S. stock market	Structural VAR model	The study showed that the reaction of U.S. real stock returns to an oil price shock differs greatly depending on whether the change in the price of oil is driven by demand or supply shocks in the oil market. The demand and supply shocks driving the global crude oil market jointly account for 22% of the long-run variation in U.S. real stock returns. The responses of industry-specific U.S. stock returns to demand and supply shocks in the crude oil market are consistent with accounts of the transmission of oil price shocks that emphasize the reduction in domestic final demand.
19	Tang, Wu, & Zhang (2008)	Oil price shocks and their short- and long-term effects on the Chinese economy	Structural vector auto-regressive model.	Their results showed that an oil-price increase negatively affects output and investment, but positively affects inflation rate and interest rate. Their decomposition results also showed that the short-term impact, namely output decrease induced by the cut of capacity-utilization rate, was greater in the first one to two years, but the portion of the long-term impact, defined as the impact realized through an investment change, increases steadily and exceeds that of short-term impact at the end of the second year. Afterwards, the long-term impact dominates, and maintains for quite some time.
20	Huseynov (2015)	An analysis of the effect of oil price shocks on	A dynamic panel model similar to those posited in Hamilton	The regressions results suggested a significant relationship between oil price

		GDP and Final consumption growth, major oil exporting countries (Countries: Norway, Azerbaijan, Canada, Kazakhistan, Mexico and Russia)	(2003, 2005)	shocks and GDP and final consumption growth. It also appeared that countries do not experience lagged effects of oil price shocks (at an annual frequency), which is either attributable to countries adjusting oil production or smoothing them out through monetary or fiscal policy adjustments.
21	Park & Ratti, (2008)	Oil price shocks and stock markets in the U.S. and 13 European countries	Vector autoregressive model (VAR)	Oil price shocks have a statistically significant impact on real stock returns contemporaneously and/or within the following month in the U.S. and 13 European countries over 1986:1–2005:12. Norway as an oil exporter shows a statistically significantly positive response of real stock returns to an oil price increase. For many European countries, but not for the U.S., increased volatility of oil prices significantly depresses real stock returns. The contribution of oil price shocks to variability in real stock returns in the U.S. and most other countries is greater than that of interest rate.