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OIL PRICE SHOCKS AND MACROECONOMIC INSTABILITY IN NIGERIA: EVIDENCE FROM A GLOBAL VECTOR AUTOREGRESSION (GVAR)

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DECLARATION

I hereby declare, on my honor, that the following Master's Thesis to be submitted entitled, "OIL PRICE SHOCKS AND MACROECONOMIC INSTABLITY IN NIGERIA: EVIDENCE FROM A GVAR" is my independent work and has been written in accordance with scientific ethics and traditions, wherein all sources used have been cited and included in the bibliography.

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ÖZET

Bu çalışma Nijeryada temel makroekonomik değişkenler ile petrol fiyat değişimleri arasındaki dinamik ilişkileri incelemektedir. Aradaki ilişkinin incelenmesinde Nijerya'nın temel ticaret ortaklarını da içeren Küresel Taşıyıcı Özbağımlı Modeli (Global Vector Autoregressive Model) benimsenmiştir . Bu dolaylı ve dolaysız olarak açılma etkisi ve ilk-raund ve ikinci-raund etkileri aracılığıyla petrol fiyat değişimlerinin nasıl Nijerya'ya aktarıldığına dair bütüncül bir resim oluşmasını sağlar. İç değişkenlikler olarak gerçek brüt iç üretim (y), enflasyon (Dp), kısa-dönem faiz oranları ve gerçek nakit döviz değişimleri (epeps) kullanılırken petrol fiyatı küresel değişken olarak kabul edilmiştir. Çalışma Nijerya, Amerika , Avrupa, Hindistan, Çin, Brezilya, Birleşik Krallık ve Güney Afrika ekonomilerini içermektedir. Amerika ekonomisinin küresel ekonomideki hakimiyetinden dolayı baskın ekonomi olarak işlem görmektedir ve petrol fiyatları VARX'a iç değişken olarak girmektedir. 1972Q2-2013Q1 periyodunu kapsayan ve kaynak olarak GVAR araççubuğu, IMF, Dünya Bankası, BIS ve CBN'in istatistik bültenlerinden yararlanılan 3 aylık veri kullanılmıştır. Değişkenlikler üzerinde eşbütünleşme testi, zayıf dışsallık testi, esneklik etkileri; ve GVAR modelinde değişkenliklerin ve model sağlamlılığını belirlemek için yapısal kırılma ve devamlılık görünümü gibi testler yürütülmüştür. Çalışmanın bulguları petrol fiyatındaki ani artışın gerçek enflasyon sonuçlarında ve kısa dönemde kısa dönem faiz oramlarında düşüşe ancak gerçek nakit döviz değişim oranlarının artmasına neden olduğunu ortaya çıkarmaktadır. Dolayısıyla dünyada petrol fiyatlarındaki ani yükseliş ekonominin rekabet gücünü daraltarak Nijerya'nın makroekonomik etkiliğini gerçek nakit döviz değişimi aracılığıyla etkilemektedir. Diğer değişkenler hükümet ve zirvedeki bankalar gibi ekonomideki temel oyuncuların etkinlikleri, açılma etkileri. Ekonominin çeşitliliği, güvenilir mali politikalar, petrol gelirlerini koruma, petrol kazançlarının parasallaşmasında daralma ekonomiyi durağanlaştırmada yardımcı olacağı tavsiye edilmektedir.

Anahtar sözcükler: GVAR, GIRFs, Makro Ekonomi, İstikrarsızlık

ABSTRACT

The study examines the relationship between oil price shocks and selected macroeconomic variables in Nigeria. It adopts a Global Vector Autogressive (GVAR) model, which includes Nigeria's major trade partners, in examining the relationship. This provides a holistic picture of how oil price shocks are conveyed to Nigeria via the first-round as well as through the spill-over effects. The variabes employed are: Real Gross Domestic Product (y), inflation (Dp), short-term interest rate (r) and real effective exchange (epeps) as the domestic variables, while oil price is included as global variable. The economies included are Nigeria, the United States, Euro, India, China, Brazil, United Kingdom and South Africa. Due to the importance of the United States economy in the world, it is treated as the dominant economy and oil price enters it VARX* as domestic variable. Quarterly data were used spanning the period 1979Q2 to 2013Q1 and were sourced from GVAR toolbox, IMF, World Bank, BIS and CBN statistical bulletin. Tests were conducted on the variables such as the cointegration test, weak exogeineity test, impact elasticities; and test on the GVAR model itself such as persistence profiles and structural breaks to ascertain the robustness of the model and variables included. The findings of the study reveal that an upsurge in oil price leads to decrease in real output, inflation and short-term interest rate of Nigeria in the shortrun while real effective exchange rate rises. Hence surge in the price of oil in the world affects macroeconomic activities in Nigeria through the real effective exchange rate by contracting the competitiveness of the economy. Other variables are affected through the spill-over effects and the activities major players in the economy, such as the apex bank and the government. Diversification of the economy, credible monetary policies, saving proceeds from oil receipt and the reduction in the monetization of the oil receipts are recommended to help stabilise the economy.

Keywords: GVAR, GIRFs, macroeconomy, instability.

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ABBREVIATIONS

BIS - Bank for International Settlements

CBN - Central bank of Nigeria

CIA - Central Intelligence Agency

DdPS- Dees, di-Mauro, Pesaran and Smith

DOTS- Direction of Trade and Statistics

ECOWAS- Economic Community Of West African States

IEA - International Energy Agency

IFS- Internation Financial Statistics

IMF- International Monetary Fund

NBS - National Bureau of Statistics of Nigeria

NRCAN - Natural Resource Canada

OPEC- Orgainisation Of Petroleum Exporting Countries

PSW- Pesaran, Schuermann, Weiner

WAMA - West African Monetary Agency

UK- United Kingdom

US- United States of America

INTRODUCTION

Energy takes a chunk part of development. In fact, the amount of energy requirement of an economy depicts how developed it is or how fast it is growing . Oil is an essential source of energy and even with the optimistic assumptions of the growth of alternative sources of energy, oil will most likely remain the leading component of energy mix. In the year 2008, oil accounted for approximately 34% of world's energy needs (NRCAN 2010) and it is projected by the International Energy Agency (IEA) to stand at 30% by the year 2030. Oil is an engine of growth in modern economies, the most important natural resource, needed in a wide range of production acitivities and also final consumption. The shocks in oil price over the years and the attendant macroeconomic implications on economies in the world have drawn the attention of researchers; econometricians and economists alike as well as policy makers.

Since after the second world war, price of oil has swung more frequently than the prices of other commodities and/or assets(Adeniyi, 2011). This couple with the resultant implications it has had on economies either as importers or exporters made the studying of the impacts of the shocks on an economy or group of economies inevitable. Luft (2006) stated that since 1970s the world has been affected adversely because of the fluctuations in the price of oil. Hamilton (1983) in a similar vein, in his seminal paper posited that all the recession in the US after the world war II were causeed by upsurge in oil price except one. The previous studies on the implications of oil price shocks on economic activities focued mainly on the net oil-importing countries and aimed at establishing causal relationships between oil price shocks and certain major macroeconomic variables as selected by the respective reseachers. The reason was that the first positive oil price shock and the recession that ensued in the oil dependend economies were viewed as permanent. Although the studies could not establish the strong causation relatioships, the empirical results revealed that with a sudden positive oil price shock, the consequence is a fall in output growth (Adeniyi, 2011). With subsequent oil price shocks, a number of alternative explanations were developed. Such explanations hold that with increase in oil price, response is not instantaneous in terms of consumption and investment, as economic agents anticipate and predict that the price change is temporary, which is typical of a positive shock in

oil price. Consequently, the fall in output is also slow. The negative oil price shocks of the 1980s and the weakening of the resource influence on real macroeconomic activities led to the studying of the asymmetric relationships between oil price shocks and macroeconomic variables. Non linear transformations were introduced in order to reestablish the relationship between increases in oil prices and economic downturn. This was because the fall in oil prices, specifically in the second half of the 1980s, were found to have smaller positive impacts on economic acitivities as predicted by linear models (Aliyu, 2009)[1].

A transmission channel mechanism has been excogitated to explain how oil price shocks are channelled to econnomies and their consequent effects on real economic activities. Notably, two channels; supply and demand, have been prominent in the literature, while other postulated channels such as economic policy reaction, valuation and asymmetric response channels have been viewed to be ambiguous with the latter channels technically oriented (Akinyele and Ekpo, 2013). In the supply side, oil is an important input for production and other commercial activities. As such, a positive oil price shock translates into increase in production as well as distribution costs consequently leading to lowering of production by firms. The demand side effects entail the influence or response of consumption and investment to oil price volatility. Consumption shares a positive relationship with disposable income which means highly oil price less consumption. In the case of investement, an increase in oil price leads to a rise in production cost and consequently a slow down in investment. Oil price volatility can also affect financial and monetary stability through various channels. Such channels include rise in interest rate, inflation, and stock exchange market panic and distort foreign currency exchange.

Theoritically, increase in oil price results in shift of the terms of trade in favour of the net oil exporting economies. It induces high cost of production, since oil is a production input, and consequently rise in inflation and slow down of economic activities to net oil importer. The more inelastic oil is to an economy, the greater the negative impact of an upsurge in the price of oil has on such economy. In the net-oil exporting economies on the other hand, the upswell leads to a rise in income. this is

[1] . Such studies include; tatom (1988); Mork, (1989); Bernanke et al, (1997); Hooker, (1999); Brown and Yucel, (2002); Mehrara, (2008).

however temporary and fades away quikly due to the slow down in economic activities suffered by the net-oil importers (Wakeford, 2006; Majidi, 2006).

Nigeria, being an emerging market and a net oil-exporting country, is highly vulnerable to oil price upsurge due to its dependence on the resource, oil. Since the end of the country's civil war that coincided with the positive oil price shock of early 1970s and the resultant increase in revenue from the sector, the country has come to be known as a monocultural economy, neglecting other sectors. As a monocultural economy, Nigeria is excessively dependent on oil revenue, with the resource accounting for over 95% of export earnings and 85% of government revenue. The share of oil in the GDP in 2008 was 17.85% (Aliyu, 2009) and 15.85% in 2010 (NBS and CBN, 2014). The country is highly dependent on the oil resource that the government budget is benchmark to the world oil price. As such, any fluctuation in the price will mean either a windfall, as a result of price increase, which is unduely monetize and not channelled into the appropriate areas due to corruption or budget deficit; because of the drop in the price of oil, as government resort to borrowing and/or expending its foreign reserve in order to finance its budget due to regidities that would not allow it to cut the budget and the sticky nature of the Nigerian government expenditures (Akpan, 2009). Additionally, Nigeria is adverserly affected by oil price volatility via the importation of motor spirit and other refined pertroleum products. The country's local refineries have been operating far below capacity since the late 1980s. It gets more than 90% of its domestically consumed petroleum prouducts through importation (Aliyu, 2009). This has made the importation of refined petroleum products to enter the group of top imported products to the country. For instance, the share of oil in total for the year 2008, 2009 and 2010 stood at 26.72%, 20.84% and 34.96% for the year 2008, 2009 and 2010 respectively; and have been one of the top three most imported products (NBS and CBN, 2014). To alleviate the impact of rise in oil price, the government provided subsidies on the imported products. This became economically irrational to sustain and on the 1st of January 2012 all subsidies were removed. This move however, caused a natiowide outburst of rage and protest which led to the reversal of the decision only to be reintroduced in 2016.

Due to the significance of oil to Nigeria and how shocks in its price have been determining real economic activities in the country, either directly or indirectly,

economists and policy makers are becoming more interested in understanding them, by undertaking research and studies, and proffering recommendations and possible solutions to cushion the effects or remove them[2]. Each of these studies employed either similar models or different, so also with the macroeconomic veriables adopted for the respective studies and have reached similar or differing conclusions in terms of the impacts of oil price shocks on the country's macroeconomic variables.

To our knowledge, this will be the first study that employs the GVAR model in order to present a more holistic approach to the understanding of the mechanism of how shocks in world oil market are transmitted into Nigeria, by allowing for trade linkages. Hence, investigating the tramission channels as well as the impacts of these shocks from both the world oil market itself and from the country's trade partners to the economy. Going by its perculiarities as a country that imports over 90% of the petroleum products it uses domestically usually at a cost that naturally reflects international crude oil price (Obayi, Innocent and Jeffrey, 2012) and the fact that it imports virtually all the machineries and other technological inputs and well as certain consumer goods that it uses in other industries and sectors of the economy from the oil dependent economies, investigating the tramission channels using a GVAR will produce a better revealing and more complete picture of what happens. The study adopts a customize GVAR , including only a subset of countries and region, Nigeria's major trading partners. This as revealed by Assenmacher (2013), where he modelled the GVAR for Switzerland by including the 3 largest trading partners of Switzerland whom represent 80 percent of the country's trade, is sufficient to examine and understand the shocks and impacts of the global variable- oil price- on Nigeria's macroeconomy.

Statement Of Research Problem

The unpredictable swings in oil price at certain but not regular intervals that started especially in 1973 and the resultant effects on macroeconomy of net-oil importing countries as well as net-oil exporting countries continue to occupy the mind of policy makers and economists. Nigeria, an emerging market economy and the

[2] Such, studies include; Olusegun, (2008); Aliyu, (2009); Mordi and Adebiyi (2010); Umar and Abdulhakeem, (2010); Adeniyi, (2011); Muhammad, Sulaiman and Kouhy, (2011); Ojapinwa and Ejumedia, (2012) ; Akinyele and Ekpo, (2013); Riman, Akpan and Offiong, (2013); ThankGod, (2013); Omojolaibi (2013); Oyeyemi, (2013); Olufisayo, (2014).

number one oil producer on the African continent as well as the biggest economy on the continent, relies almost solely on income from the oil sector. Oil accounts for about 90 percent the of total export earnings of the country and approximately 70 percent of the government revenue in the budgets (Akpan, 2009). The government which is comparatively bigger than the private sectors and who receives the revenue, becomes the agent whose behaviour defines the features of the Nigerian economy. Consequently, fiscal and monetary policies become determine by world oil price and fluctuations in the price inject instability in the Nigeria economy. According to Obadan (2009), of all the major sectors of the economy, only the oil and gas sector presents negative impact on the economy that could be up to 4.49% of GDP, in spite of having a large share of GDP at 23.2 percent.

Nigeria is an economy that not only excessively depended on oil for foreign exchange but also imports virtually all of the capital, intermediary and consumer goods it uses in other sectors of the economy including petroleum products- it imports more than 90 percent of the petroleum products it needs domestically from oil depended economies. It has made it apposite to investigate the effects of the swings in oil price on the Nigeria macroeconomy and possibly trace the channels of tramission of the surge to the economy taking into account the country's trade linkages.

In view of the above problems, the following questions are put forward:

- To what extent does an oil price shock affect key macroeconomic variables and hence economic activities in Nigeria?
- How long does it take for a shock to wear out?
- Does the economy move back to its initial equilibrium before the shock in the long run?

Aims And Objectives

The Objectives of this study are:

- To analyse the impacts of oil price shocks on the selected macroeconomic variables in Nigeria.

- To measure the magnitude of the impacts of positive oil price shocks on the Nigerian economy.
- To investigate the shortrun effects of positive oil price shocks on the economy.
- To examine the transmission channels while taking into consideration the trade linkages.

Significance Of The Study

Nigeria, a monocultural economy that excessively depnds on the export of oil, is very sensitive to developments in the world oil market. Hence, this study, that to our knowledge is the first to employ the GVAR framework in the case of Nigeria, provides a holistic approach to the transmission channel mechanism and a broader picture of what happens as it incorporates the trade linkages of the economy to its trading partners'.

The study examines the shortrun dynamics of the positive of oil price shocks on Nigeria, which heavily depends on oil revenue from export, and imports over 90 percent of petroleum products it uses domestically.

Using a GVAR to study the impacts of such upsurge on Nigeria provides compact model that captures the direct effects as well as the spillovers.

Finally, this study would be useful to policy makers and can be consulted in formulating economic policies. Especially as it examines if the country can reach its steady state with its current peculiarities.

Scope And Limitations Of The Study

The study focuses on examining the transmission channels of oil price shock as well as the magnitudes and directions of the impacts of positive oil price shocks on the selected macroeconomic variable of Nigeria. It explores the oil-macroeconomy relationships using a GVAR framework. This allowed us capture not just the direct impacts but also the spillovers as GVAR model is a compact model of the world. The period covered by the study is 1979Q2 to 2013Q1. This period includes the periods of

major positive oil price shocks, with the exception of the 1973, but including shocks associated with surge in demand .

The limitations of the study include the application of a GVAR modelling which includes only the country's largest trading partners. Building a GVAR that includes more economies and macroeconomic variables could provide some additional information. Also, the period covers by the study is the period when oil demand shocks are more prominent than oil supply shocks (Lorusso and Pieroni, 2015), and the advanced economies have developed mechanism of cushioning the effects of positive oil shocks on their respective economies. In addition, negative oil price shocks are not taken into consideration and no sign restrictions imposed. If sign restrictions are imposed the real GDP of Nigeria can share positive relationship with positive oil price shock. Also, the magnitude of response of Nigeria's real output to a negative shock to Euro's output can be larger (Cashin et al, 2012)

Organization of the Study

The remainder of this research is organized as follows: Chapter 1, the review of the Nigerian macoeconomy and empirical literature. Where empirical literatures related to oil price shock and its macroeconomic implications. Chapter 2 provides the methodology- data set, the variables employed as well as model specification. Chapter 3 covers the empirical results, analysis and interpretations. In the last part, we have the conclusion reach, policy implication as well as recommendation and suggestions for further research.

CHAPTER I

REVIEW OF NIGERIAN MACROEONOMY AND EMPIRICAL LITERATURE

1.1 History Of Nigerian Economy

Nigeria lies in West Africa on the Gulf of Guinea covering a total land area of $923768km^2$ making it the 32nd largest country in the world. The country is the most populous country on the continent with the population of over 170 million which is 47% of the total population of the West African region (World Bank 2013). Her trade with the rest of the world and GDP represent 60 percent of West Africa's external trade and 60% of the region's GDP (European Commission, 2007). The area, Nigeria, comprising of emirates largerly in the north, kingdoms in the south west and communal political system in the south east, before colonization, came under British rule in the year 1903. In 1914, the nothern protectorate, southern protectorate and the colony of Lagos were amalgamated and named Nigeria by the then Governor-general of the area, Sir, Frederick Luggard. The country remained under the british rule until 1960 when it gained independence and became a republic in 1963. The country has had a long trading ties with the rest of the world even during the precolonial era. The North had the trans-saharan trade where it trades with traders largerly from North Africa and the Middle East, particularly the arabs and the muslim world. The South due to its proximity to sea was in contact with the Europeans who were exploring the world mainly for economic reasons. During the colonial period, Nigeria was both a raw material producer domain for Britain and a market for its final product. The major exports of the country at that time were agricultural products, such as, cotton, cocoa, groundnut, and rubber. In 1956, oil was discovered in Oloibiri, in Bayelsa state; and exploration started in 1959 (OPEC, 2014).

After independence, the agricultural sector which has been the mainstay of the economy and the largest employer of labour in the nation continued to be the country's main foreign exchange earner until after the first oil boom of the 1970s. Oil has come to dominate the export scene of the country since mid 1970s constituting 96 percent of the total exports (Oladuru, 2008 and Barungi, 2014). The share of agriculture continues to shrink while the proportion of imports of agricultural products continues to rise. For

instance, in the 1970s the annual production of cotton, groundnut, cocoa and rubber fell by 65 per cent; 64 per cent; 43 per cent; and 29 per cent respectively (Ayodele 1997); as the share of imports from the same sector more than doubled (Odularu, 2008). This sector, which is largely informal, remains the largest employer of labour in the economy, employing about 70 percent of the workforce, a large portion that is poor (Barungi, 2014). In 1960, agriculture contributes 63 percent of the GDP, by 1988 it has declined to 34 percent while in 2013 it stands at 112.26 USD which is 21.97 percent of the GDP (NBS, 2014). The decline was as result of the boom in the oil sector which lured labour to the urban centres and the continuing growth of other sectors.

The non-oil sector coupled with large domestic demand continues to be the main driver of the economy as the share of oil sector falls due to disruptions in production as a result of oil theft, vandalization, flood and activities of militants in the Niger-Delta region, the major oil producing region of the country, which cause drop in production (World Bank, 2013). Recently, the service sector has become a major force of the economy; particularly, telecommunication and entertainment which are becoming more prominent and impacting the economy greatly. In the 1990s, the motion pictures never appeared in the GDP while the telecommunication was less than 1 percent. In 2013, after rebasing of the economy, the motion pictures and the telecommunication industry contribute 1.4 percent and 9 percent to the GDP respectively (NBS, 2014). The Telecommunication sector is the fastest growing sector of the economy today. Its growth rate in 2012 averaged 33.63 percent (FSDH, 2013) and it accounts for more than one-quarter of the upgrade in the GDP (The Economists, 2014).

A survey of the history of the Nigrian economy in terms of the sectoral share of the broad sectors: Agriculture, industry and service; reveals that there has been variations over time with the sectors diplacing one another at some specfic point in time. As depicted in Table 1 below, in 1980, industrial output accounted for 40% of the total output in Nigeria. The service sector was second producing 30 percent of all the outputs during that period with Agriculture which prior to then was the leading sector having the least. The apparent increase in industry was as a result of the of the activities in the mining subsector, especially the petroleum. By 1990, agriculture

displaced the service sector to become the second driver of growth in the economy. By 1995, the agricultural sector has displaced the indusrtial sector becoming the sector with the highest share of total output as it accounts for 43 percent of the total ouptut. In 2001, 2003 and 2004, the industrial sector took over contributing 45, 49 and 39 per cent of total output becoming the largest contributor to the total output. The agricultural sector recorded an output contribution of 26 to 31 percent during the period coming as second.

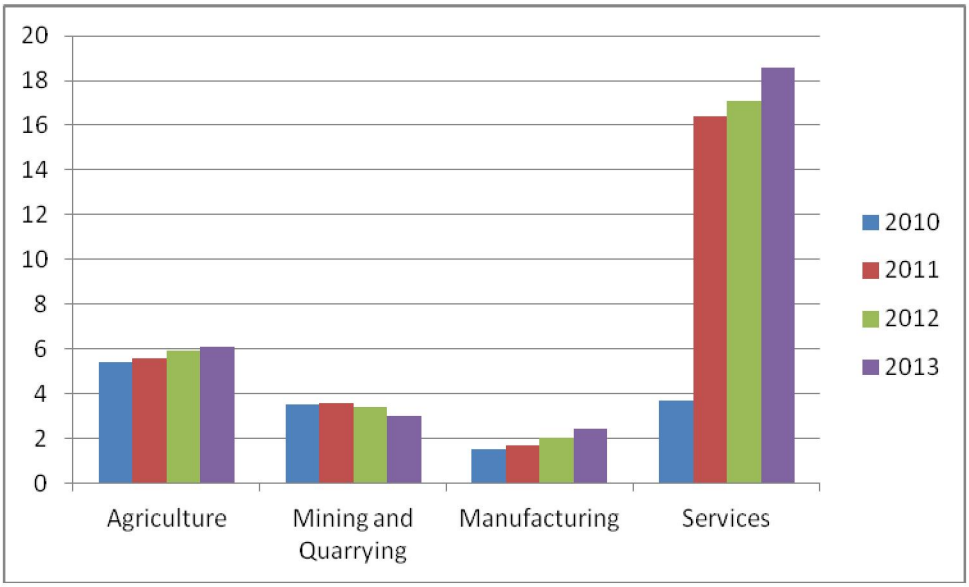
Table 1 : Sectoral Share of GDP

Sectoral Share Of GDP	1980	1990	1995	2001	2004
Agriculture	27.0	33.0	43.0	30.0	31.0
Industry	40.0	41.0	26.0	45.0	39.0
Services	33.0	26.0	31.0	25.0	30.0

Source: Ogunkola, E.O., Banlole, A. S., & Adewuyi, A. O. (2006). An Evaluation of the Impact of Nigeria's Trade and Investment Policy reforms. African Journal of Economic Policy, Vol. 13, No. 1, June, pp. 81-118.

With the rebasing of the GDP to 2010 base year, the service sector whose share of the GDP was 3.7 per cent in 2010 jumps to 16.4, 17.1 and 18.6 for the year 2011, 2012 and 2013 respectively as can be deduced from the bar chart below. This sector more than triple any of the other sectors since 2011 and was driven by telecommunication and trade. It is followed by the agricultural sector and then the mining sector which is dominated by oil and has dwindle from 3.5 per cent in 2010 to 3 per cent in 2013 due to fall in production.

Figure 1: Sectoral Share of GDP



Source: National Bureau of Statistics, 2014

As democracy is being strengthened in the country, over the last decade the country has carried out an ambitious reform agenda. The budget today is base on a conservative reference price for oil, since it accounts for almost 75 per cent of consolidated budgetary revenues, and excess saved in the Excess Crude Account. The growth rate of the economy between 2003 to 2010 average 7.6 per cent, but the weakenesses in the oil sector pose heighten macroeconomic risk for the country since the budget largely depends on the revenue from oil which also represent about 90 per cent of the exports. Due to the Paris Club debt restructuring championed by the Obasanjo adminisration in 2006, the country's foreign debt is now only 3 per cent of GDP while the domestic debt is 16 percent of GDP (World Bank, 2013).

Oil price shocks either positive or negative has had profound resultant effects on Nigeria since the first oil boom of 1973. Oil price shocks are fluctuations of the price of oil in the commodity oil market. This could be decrease (negative shock), or increase (positive shock) as a result of supply side disruption such as OPEC quotas, political upheavels in the Middle East (the largest oil exporting region), security concerns, and increase in demand such as in the 2000s by the emerging markets and developing economies (Akpan, 2009). The negative shock could be traced to fall in demand as a result of weaker growth in oil consumption, discovery of a cheaper

alternative (substitute), increased efficiency in the use of oil and fall in growth rate or global recession (Helbling, 2013). Positive oil price shock is considered in the study.

As the biggest oil producer on the African continent and number six in the world with oil being the largest export commodity and earner of foreign exchange, Nigeria has experienced all the oil price shocks since early 1970s both negative and positive which have come with consequent effects on the macroeconomy. For example, the first oil boom of 1973 - 74 led to a 600 percent increase in Nigeria's export measured in US dollars. The terms of trade rose from 18.9 in 1972 to 65.3 in 1974. The revenue of the Governement also showed positive reaction rising from 8 percent in 1972 to about 20 percent in 1974. Other oil shocks include the 1979 - 1980 (positive), 1986 (negative), 2000s (positive). The positive shock of 2003 - 2006 was gradual and persistent giving rise to the share of oil in the country's GDP from 80% in 2003 to 82.6% in 2006 (Akpan, 2009).

Even though oil price shocks are believed to come with certain benefits, the economy of Nigeria, a net oil exporter, even during the oil booms was undisireable. For instance, in the 1970s huge fiscal deficit was recorded, double digit inflation, and money supply grew steeply. This could be attributed to corruption, ineffecient management of the oil receipts, and weak institutions (Akpan,2009).

Below is a table of some selected macroeconomic variables from 1970 to 2013 depicting their respective movements over the periods.

Table 4: Macroeconomic Indicators in Nigeria

Year	Inflation Rate (%)	Money Growth(%)	Real Interest Rate(%)	Deficit/GDP Ratio(Nm)	GDP Growth(%)
1970	13.8	43.7	-6.3	-8.7	25
1975	33.9	52.1	-24.9	-2	-5.2
1980	10	50.1	-0.4	-3.9	4.2
1985	5.5	8.4	6.25	-2.1	9.7
1990	7.4	29.5	13.2	-4.4	-8.2
1995	72.8	16.3	52.01	0	-2.5
1998	10.8	17.2	11	-3.3	-1.9
2000	6.9	13.3	23.1	-1.5	3.8
2002	20.2	21.6	3.8	-3.8	1.5
2003	14.0	24.1	7.6	-2	10.7
2004	10.0	26.6	5.4	-1.5	6.58
2005	11.6	30.8	1.6	-1.1	6.51
2006	8.6	27.82	10.1	-0.6	5.63
2007	5.4	65.0	11.6	3.0	6.8
2008	11.6	58.5	4.2	14.8	6.3
2009	11.5	17.2	23.7	-0.3	6.9
2010	13.7	6.8	-42.3	7.9	7.8
2011	10.8	13.0	5.9	9.9	4.9
2012	12.2	16.8	6.9	18.5	4.3
2013	8.5	13.2	10.2	5.1	5.4

Source: Central Bank of Nigeria and World Bank Development Indicators.

1.2 Nigeria's Trade Relations

Nigeria has a long standing trade relation with its oldest trading partners, especially the United States, United Kingdom and Europe. During colonialism this was dominated by the activities of Britain; but after independence and especially with the commercial exploration of oil in the country, the United Sates has become the country's largest trading partner, especially, in terms of export. This is followed by European Union(EU); particularly, Spain, the Netherlands, France, Germany; and the United Kingdom. Also in terms of imports, these countries are the major trade partners of Nigeria with Belgium replacing Spain in the top ten import partners of Nigeria (IMF, 2013) . With the rising of emerging markets like South Africa, Brazil, India and China which are soaring and becoming more and more active players in the world economy, the demand for oil has increased and these countries have come to be major trade partners of Nigeria as well -both in terms of imports and exports, with the exception of South Africa which is in terms of import- (IMF, 2013).

Nigeria's foreign trade, particularly export, is dominated by petroleum and petroleum products which accounts for no less than ninety five percent. In 2012, the IMF estimated that 96% of the revenue of the country from export came from oil and natural gas (EIA , 2013). This sector accounts for 90% of foreign exchange earnings for the country (Ignatius, 2014) and has enable it to record surplus in its balance of trade especially since the 1970s. The major export commodities of Nigeria are oil and oil related products which accounts for 95 percent, cocoa and rubber. The main imported commodities on the other hand are machinery; chemicals, refined petroleum products; manufactured goods; transport equipment; food, and live animals (CIA, 2014 and NBS, 2014). The share of the country's trade in the world is very small, accounting for approximately 0.7, 0.4, 0.5, 0.6, 0.6 and 0.5 percent of global exports; and 0.4, 0.3, 0.3, 0.3, 0.3and 0.3 percent of global imports for the years 2006, 2009, 2010, 2011, 2012 and 2013 respectively(European Commission, 2007 and 2014).

In 1960 Nigeria got her independence from the United Kingdom and since then it has established diplomatic as well as bilateral economic relations with the United States who is the largest foreign direct investor in the economy. Such economic relations include the bilateral trade and investment framework agreement, and the African Growth and Opportunity Act (AGOA), which Nigeria qualifies for. Nigeria is

the largest sub-Saharan exporter of oil to the U.S. with Angola and the Republic of Congo coming in as second and third (David, 2013). The United states has been Nigeria's largest trading partner for atleast more than a decade until 2013 when India overtook it in terms of export destination, and China in terms of import from 2004 to 2013 excluding 2006, 2010 and 2011(UNCTAD COMTRADE, 2014). Since 1986, the United states has imported between 9 percent to 11 percent of its crude oil from Nigeria making her the fifth largest supplier of crude oil to the United states. By 2012, the import has declined by almost 50 percent from the previous year making her the sixth largest supplier. The trend continued and by 2013, Nigeria supplied marginally less than 4 percent of US crude oil imports which puts her at eight largest supplier. This was largely as a result of the increased domestic production in the United States especially of light, sweet crude from Bakken and Eagle Ford, and the idling of two refineries on the East Coast of the country in late 2011 which were major importers of Nigeria's crude oil as well as the reduction in imports by refineries on the Gulf Coast (EIA, 2013). Almost all of Nigera's export to the United States is crude oil. For instance, in 2013 approximately 96 percent was crude oil, while only 4 percent was other commodities.

As the United States import of Nigeria's oil drops that of Europe's rises. In 2011 and 2012, it increased by more than 40 percent and in 2012 it imports 44 percent of Nigeria's oil export (EIA, 2013). EU is not only the largest regional trade partner of Nigeria but also the largest regional importer of Nigeria's oil. Nigeria has been the largest trade partner of Europe in the West African region. In fact, about half of the exports from Europe to the region goes to Nigeria and approximately 70% of the export from the region to Europe comes from Nigeria. No doubt, oil takes the chunk part. Nonetheless, Europe also import non-oil products and invest in Nigeria. For instance, the total amount of invesment of the Euro region in Nigeria was put at approximately €30bn in 2010 (Delegation of the European Union to Nigeria and ECOWAS, 2010). The Euro area is the second largest trade partner of Nigeria, coming after the US. Its total trade with Nigeria amounts to 25% of Nigeria's trade with the world and 22% of Nigeria's exports go to the Euro zone. Nigeria's share of EU trade is 0.8 and 0.6, 0.7 and 0.7, 1.0 and 0.8, 0.8 and 0.8, 0.9 and 0.8, 1.4 and 0.8, 1.8 and 0.7, 1.7 and 0.7 for exports and imports respectively for the years 2006 to 2013 in

percentages (European Commission, 2014). Trade between the two economies has been in accordance to the Cotonou Agreement signed in 2000.

Although Nigeria and China signed the Joint Communiqué on the Establishment of Diplomatic Relations in February 1971 formally establishing diplomatic relations as well as trade's, trade between the two countries remained very low until 1993 when China transformed from net exporter to a net importer of oil. In fact, it the second-largest importer of oil, second only to the United States (Utomi, 2007). In 2001 the two countries signed an agreement on trade and investment promotion and protection which has brought about the dawn of exponential trade growth between the two countries. The value of trade of less than USD 2 billion in 2000 rose to USD 17.7 billion in 2010 accounting for nearly one third of the trade between China and West Africa (Egbula and Zheng, 2011) and from 2004 to 2013 China was the largest exporter to Nigeria displacing the US expect in 2006, 2010 and 2011(UNCTAD COMTRADE, 2014). Trade between the two economies has been in favour of China as Nigeria continues to record deficit, which is expected to increase significantly as trade relations between the countries keeps on soaring. Trade agreements between the two countries include Agreement for the Avoidance of Double Taxation and Prevention of Fiscal Evasion with respect to Tax on Income in 2002, Agreement on Tourism Co-operation in 2002, Agreement of South-South Co-operation among China, Nigeria and FAO in 2003, Memorandum of Understanding on a Strategic Partnership in 2006 and the Agreement against fake products exported to Nigeria from China in 2009.

Apart from China, two other BRICS countries, India and Brazil, with long relations with Nigeria spanning as far as before the country's independence are today its major trade partners both in terms of export and import especially since the country's return to democracy in 1999. Nigeria is seen as the largest trade partner of India on the African continent.(Alao, 2011). Indo-Nigeria trade relations could be traced back to 1923 with the establishment of K. Chellaram, an india trading company, when both countries were still british colonies, which marked the begining of formal economic relations between the countries (Kuar, 2009). From 1969, trade balance between the countries was in favour of India, with the exception of 1988 which was balanced, until 1990 when Nigeria's exports to the country exceeded its imports (Kura,

2009). Since, then it has recorded trade surplus largerly due to India's incereased demand for crude oil from the country and by January 2009, the level of Nigeria's trade with India has surmounted that of all of the country's partners in southern, central and west Africa (Vasudevan, 2010). In 2013, India displaced the US, Nigeria's largest trade partner, as the number one export destination of Nigeria (UNCTAD COMTRADE, 2014). Nigeria export commodities to India include oil, pearls, wood, cotton, cashew nuts, rubber and gum Arabic; while, it imports are machinery, textiles, wood and products paper, chemicals, plastics, transport equipment, drugs and pharmaceuticals.

Trade between Nigeria and her ten major trade partners for the period 1996 to 2013, which includes the period in which trade between the country and the BRICS member countries is solider, are summarized below both in exports and imports. Table 2 shows the flow of export commodities from Nigeria to her major export destinations which is dominated by the United states overall. In 2005, the United states alone accounted for 53.72 percent of Nigeria's total export which is a 9.63 percent increase from the previous year although it falls to 45.02 percent in 2006. From 2007, the amount of export from Nigeria to the United States dwindles continously relative to the world which could be attributed to the economic meltdown in the United States that snowballed into the world financial crisis, and shale oil production recently taking place in the United states, which by 2012 have caused a decline of oil imported by about 50 perecnt from previous years by the United States from Nigeria . India stepped in, in 2013, to become the major export destination for the country followed by Netherlands and Brazil with the United States as the fouth. Over the period, the United States on average imported 37.08 percent of Nigeria's export commodities. In 2009, the total export of Nigeria to the 10 partners, which has consistently remain above 70 percent even though not up to 80 percent since 1998, amounted to 94.44 percent of the country's total export to the world which is the highest to the partners. This falls to less than 70 percent but more than 60 percent in subsequent years, and the fall could be attributted to the fall in the United States imports from Nigeria. On average, Nigeria's export to these countries over the period, 1996 to 2013, stood at 73.76 percent of its total export to the world.

Table 2: Nigeria's Exports To Its Ten Major Export Partners in Billions (USD)

Country	India	United States	Brazil	Spain	Netherlands	Germany	France	United Kingdom	South Africa	Japan	World	Percentage share to World
1996	1.54E+08	4.25E+09	1.42E+08	1.33E+09	7.52E+08	80143070	9.84E+08	1.65E+08		1.48E+08	1.14E+10	
Percentage	1.36	37.29	1.25	11.67	6.60	0.70	8.64	1.45	0	1.30	100	70.26
1997	2.83E+08	4.64E+09	1.94E+08	9.8E+08	8.95E+08	7973848	3.2E+08	70629386		1.01E+08	1.12E+10	
Percentage	2.53	41.56	1.74	8.78	8.01	0.07	2.86	0.63	0.00	0.91	100.00	67.10
1998	2E+08	2.93E+09	3.22E+08	4.09E+08	2.96E+08	2.29E+08	3.81E+08	62169992		52584020	6.87E+09	
Percentage	2.91	42.71	4.687	5.96	4.31	3.33	5.55	0.91	0.00	0.77	100.00	71.13
1999	2.86E+09	5.47E+09	7.16E+08	9.84E+08	1.23E+08	36928896	1.44E+09	49493084		1.6E+08	1.61E+10	
Percentage	17.72	33.93	4.44	6.10	0.76	0.23	8.92	0.31	0.00	0.99	100.00	73.40
2000	3.92E+09	1.15E+10	6.67E+08	2.35E+09	2.54E+08	1.12E+08	1.66E+09	6741232	2.66E+08	1.09E+08	2.71E+10	
Percentage	14.48	42.47	2.46	8.66	0.94	0.41	6.12	0.02	0.98	0.40	100.00	76.95
2001	2.08E+09	7.32E+09	1.05E+09	1.18E+09	3.65E+08	2.44E+08	1.14E+09	44839395	1.98E+08	1.73E+08	1.8E+10	
Percentage	11.54	40.57	5.83	6.51	2.02	1.35	6.33	0.25	1.10	0.96	100.00	76.45
2002	2.16E+09	5.83E+09	1.54E+09	1.02E+09	2.89E+08	3.66E+08	9.99E+08	10665119	3.89E+08	5.5E+08	1.86E+10	
Percentage	11.61	31.33	8.28	5.49	1.55	1.96	5.37	0.06	2.09	2.96	100.00	70.70
2003	2.39E+09	9.21E+09	1.64E+09	1.48E+09	5.35E+08	5.06E+08	1.36E+09	96215445	5.9E+08	9.66E+08	2.41E+10	
Percentage	9.94	38.26	6.80	6.16	2.22	2.10	5.65	0.40	2.45	4.01	100.00	77.99
2004	52986503	1.71E+10	3.5E+09	2.56E+09	1.88E+08	3.74E+08	1.14E+09	1.91E+08	8.08E+08	1.42E+09	3.49E+10	
Percentage	0.15	49.00	10.03	7.34	0.54	1.07	3.25	0.55	2.31	4.07	100.00	78.31
2005	62363861	2.51E+10	2.64E+09	3.92E+09	9.54E+08	8.88E+08	1.47E+09	2.76E+08	6.54E+08	9.74E+08	4.67E+10	
Percentage	0.13	53.72	5.65	8.38	2.04	1.90	3.14	0.59	1.40	2.08	100.00	79.04
2006	5.51E+09	2.67E+10	2.5E+09	4.73E+09	1.53E+09	3554222	3.35E+09	31944143	1.06E+09	1.11E+09	5.92E+10	
Percentage	9.30	45.02	4.23	7.98	2.58	0.01	5.66	0.05	1.80	1.88	100.00	78.50
2007	4.4E+09	2.52E+10	3.46E+09	7.18E+08	1.75E+08	1.25E+09	1.97E+09	2.83E+08	1.38E+09	3.59E+08	5.4E+10	
Percentage	8.15	46.62	6.41	1.33	0.32	2.32	3.65	0.52	2.56	0.67	100.00	72.57
2008	7.87E+09	3.48E+10	5.31E+09	2.8E+09	3.3E+09	1.27E+09	3.37E+09	1.34E+09	2.62E+09	2.95E+08	8.18E+10	
Percentage	9.62	42.48	6.49	3.42	4.03	1.55	4.12	1.64	3.20	0.36	100.00	76.90
2009	4.77E+09	1.36E+10	3.99E+09	2.18E+09	1.34E+09	4.55E+08	2.71E+09	1.05E+09	1.68E+09	2.32E+08	3.39E+10	
Percentage	14.06	40.16	11.76	6.42	3.95	1.34	8.00	3.10	4.95	0.68	100.00	94.44
2010	9.07E+09	2.98E+10	6.04E+09	2.83E+09	3.94E+09	5.61E+08	3.51E+09	1.27E+09	1.86E+09	3.92E+08	8.66E+10	
Percentage	10.48	34.37	6.98	3.27	4.55	0.65	4.05	1.46	2.15	0.45	100.00	68.41
2011	1.28E+10	2.83E+10	1.06E+10	7.41E+09	2.68E+09	1.27E+09	7.37E+09	7.81E+09	3.24E+09	3.87E+08	1.26E+11	
Percentage	10.18	22.55	8.40	5.90	2.13	1.01	5.87	6.22	2.58	0.31	100.00	65.13
2012	1.59E+10	2.41E+10	1.08E+10	7.8E+09	9.96E+09	2.14E+09	5.96E+09	9.04E+09	4.73E+09	7E+08	1.43E+11	
Percentage	11.10	16.86	7.54	5.45	6.96	1.50	4.16	6.32	3.30	0.49	100.00	63.68
2013	1.15E+10	7.67E+09	8.58E+09	6.33E+09	9.52E+09	2.07E+09	5.31E+09	4.65E+09	4.38E+09	4.52E+08	9.06E+10	
Percentage	12.65	8.47	9.47	6.99	10.51	2.29	5.87	5.14	4.83	0.50	100.00	66.71

Source: Compiled by reseacher with data from UNCTAD COMTRADE, 2014

Table 3 below shows the values of Nigeria's imports from her major import partners and the world as well as percentage share from them. The United States dominated this sphere as well until 2004 when China displaced her; thereby, becoming the largest exporter to Nigeria and for the subsequent years. Today the United states is the second largest exporter to Nigeria with the United Kingdom as the third largest import partner of the country on average over the years under consideration with 8.8 percent share of world. The major import partners have been more varying than the export partners with countries such as Italy, Spain and United Arab Emirates (UAE) appearing and disappearing. Over the years under consideration, on average the ten major importers to Nigeria in the table below, are responsible for 62.23 percent of Nigeria's imports from the world.

Table 3: Nigeria's Imports From Its Ten Major Import Partners in Billions (USD)

Country	China	United States	India	France	United Kingdom	Netherlands	Germany	Korea, Republic of	Belgium	Brazil	World	Percentage share to World
1996	1.85E+08	8.93E+08	1.38E+08	4.4E+08	6.98E+08	3.24E+08	5.63E+08	52710829		2.38E+08	5.34E+09	
Percentage	3.47	16.74	2.58	8.25	13.08	6.07	10.54	0.99	0.00	4.47	100.00	66.18
1997	5.85E+08	9.94E+08	2.42E+08	3.65E+08	7.67E+08	2.96E+08	6.38E+08	59267373		2.59E+08	6.36E+09	
Percentage	9.19	15.62	3.80	5.74	12.05	4.65	10.03	0.93	0.00	4.07	100.00	66.07
1998	2.32E+08	8.08E+08	1.89E+08	3.72E+08	7.98E+08	3.09E+08	5.62E+08	93941536		2.87E+08	5.76E+09	
Percentage	4.02	14.02	3.28	6.46	13.84	5.36	9.75	1.63	0.00	4.98	100.00	63.32
1999	1.77E+08	7E+08	1.99E+08	3.06E+08	4.92E+08	2.98E+08	3.61E+08	85071816	1.44E+08	1.53E+08	4.48E+09	
Percentage	3.96	15.62	4.43	6.84	10.97	6.64	8.04	1.90	3.21	3.41	100.00	65.02
2000	2.53E+08	6.6E+08	1.99E+08	3.25E+08	7.55E+08	2.52E+08	5.95E+08	1.27E+08	3.15E+08	1.79E+08	5.82E+09	
Percentage	4.34	11.35	3.42	5.59	12.99	4.33	10.22	2.19	5.42	3.08	100.00	62.93
2001	5.27E+08	8.23E+08	3.16E+08	3.72E+08	1.07E+09	3.92E+08	7.81E+08	2.16E+08	4.38E+08	1.75E+08	7.96E+09	
Percentage	6.62	10.34	3.97	4.67	13.44	4.92	9.81	2.72	5.51	2.19	100.00	64.19
2002	7.41E+08	1.12E+09	3.1E+08	3.64E+08	1.1E+09	2.78E+08	5.32E+08	3E+08	5.19E+08	1.8E+08	8.76E+09	
Percentage	8.46	12.83	3.54	4.15	12.53	3.18	6.08	3.43	5.93	2.06	100.00	62.17
2003	1.07E+09	2.32E+09	3.78E+08	4.8E+08	1.42E+09	3.2E+08	1.09E+09	4.16E+08	5.34E+08	1.83E+08	1.49E+10	
Percentage	7.17	15.58	2.54	3.22	9.54	2.15	7.31	2.79	3.58	1.23	100.00	55.12
2004	1.72E+09	1.59E+09	5.4E+08	9.36E+08	1.44E+09	1.07E+09	8.94E+08	6.8E+08	2.33E+08	5.05E+08	1.59E+10	
Percentage	10.81	10.02	3.39	5.88	9.05	6.71	5.62	4.28	1.47	3.18	100.00	60.41
2005	2.3E+09	1.65E+09	8.52E+08	1.3E+09	1.49E+09	1.34E+09	9.38E+08	8.31E+08	2.73E+08	9.53E+08	1.92E+10	
Percentage	12.03	8.63	4.45	6.81	7.77	7.00	4.90	4.34	1.43	4.98	100.00	62.32
2006	3.16E+09	3.59E+09	1.11E+09	1.03E+09	2.7E+09	7.06E+08	1.28E+09	6.11E+08	1.17E+09	4.59E+08	2.29E+10	
Percentage	13.80	15.68	4.85	4.49	11.79	3.08	5.58	2.67	5.11	2.01	100.00	69.06
2007	4.91E+09	4.89E+09	1.44E+09	1.25E+09	1.72E+09	1.02E+09	1.58E+09	7.85E+08	3.96E+09	1.12E+09	3.24E+10	
Percentage	15.18	15.12	4.46	3.85	5.30	3.14	4.88	2.43	12.24	3.45	100.00	70.04
2008	4.29E+09	2.31E+09	1.02E+09	1.33E+09	1.23E+09	4.45E+08	1.91E+09	7.51E+08	1.59E+09	4.94E+08	2.82E+10	
Percentage	15.22	8.20	3.63	4.72	4.36	1.58	6.76	2.66	5.65	1.75	100.00	54.55
2009	6E+09	2.04E+09	1.24E+09	1.96E+09	1.54E+09	2.1E+08	3.05E+08	2.66E+08	1.63E+09	1.13E+09	3.39E+10	
Percentage	17.69	6.02	3.66	5.79	4.55	0.62	0.90	0.78	4.80	3.33	100.00	48.15
2010	7.32E+09	7.94E+09	2.38E+09	2.59E+09	1.23E+09	3.51E+08	2.05E+08	5.55E+08	1.71E+09	1.44E+09	4.42E+10	
Percentage	16.56	17.94	5.37	5.85	2.79	0.79	0.46	1.25	3.86	3.26	100.00	58.15
2011	9.45E+09	1.15E+10	2.47E+09	2.87E+09	1.7E+09	1.51E+09	3.01E+09	6.68E+08	2.01E+09	3.55E+09	6.4E+10	
Percentage	14.77	18.00	3.86	4.49	2.66	2.36	4.71	1.04	3.14	5.55	100.00	60.59
2012	7.72E+09	4.89E+09	2.89E+09	7.37E+08	2.36E+09	5.19E+08	9.54E+08	5.56E+08	1.31E+09	2.87E+09	3.59E+10	
Percentage	21.51	13.62	8.05	2.05	6.58	1.45	2.66	1.55	3.66	7.99	100.00	69.12
2013	9.68E+09	3.9E+09	2.11E+09	1.24E+09	2.34E+09	2.42E+09	1.54E+09	1.32E+09	2.17E+09	1.27E+09	4.46E+10	
Percentage	21.70	8.74	4.73	2.79	5.24	5.42	3.46	2.97	4.87	2.85	100.00	62.78

Source: Compiled by researcher with data from UNCTAD COMTRADE, 2014

1.3 Empirical Literatures on Oil Price Shocks

Since the first oil price shock and the phenomena of recession and high inflation that ensued concurrently, especially in the net oil importing countries which reeled in the term stagflation to describe it, a plethora of empirical works have been put forward exploring the relationships between oil price shocks and macroeconomic performance as well as tracing and establishing the impacts of the shocks on macroeconomies. These literatures include those on the developed economies, and the developing economies.

1.4.1 Developed Economies

Following the upswell in the price of oil in the mid 1970s, studies began to emerge focusing mainly on the net oil importing economies, majority of which are the developed economies. The initial belief was that the first case of rising oil price was a permanent shock and this underlies Rasche and Tatom's (1977, 1981) employment of potential GNP construction in explaining the shock and proferring how an economy would adjust after it. Some studies focus on the magnitude and contribution of a variable or an event. For instance, to what extent does a variations in oil price, monetary policy, among others results in recessions. Such studies include Rasche and Tatom (1977, 1981), and Bruno and Sachs (1982, 1985). Rasche and Tatom estimated and suggested that the 1972-74 Kom Kippur war upsurge in oil price is going to reduce long-run real GDP of the US by 7%.

Another subject of discussion in multitude of the literatures written is the channels through which oil price shocks are transmitted into an economy[3]. Kilian (2009) in a study conducted on the US economy, using a measure of monthly global real economic activity in industrial commodity markets, decomposes oil price shocks into three components: an oil-supply shock; an oil-demand shock induced by shocks to the global demand for all industrial commodities; and oil-specific demand shocks that are specific to the global crude oil market and are driven by soar in precautionary demand for oil following an exogenous events such as political events in the Middle-

[3] Such empirical works include Bernanke, (1983); Loungani, (1986); Hamilton (1988 and 2003); Bresnahan and Ramey (1992 and 1993); Dixit and Pindyck, (1994); Davis and Mahidhara, (1997); Carruth, Hooker and Oswald (1998); Finn, (2000); Davis and Haltiwanger,(2001); Lee and Ni, (2002);International Monetary Fund,(2005).

East and the activities of militant in Nigeria. He employed Structural Vector Autoregression (SVAR) and treated oil price as endegenous variable. He postulated that the consequences of the demand and supply shocks in the world oil markets are different on real growth and inflation on the US economy, and that expectations from the oil-specific demand shocks play a vital role in oil price model. He concluded that the macroeconomic effect of the 2000s oil price surge was moderate because it emanated from oil-demand shock.

Hamilton (1983), considered as the researcher that broached the studies on oil price shocks and macroeconomic instability, asserts that positive oil price shocks preceded all but one recessions in the US economy after the World War II. Using a linear specification he established a causal relationship between oil price shocks and macroeconomic indicators in the US. His results reveal that changes in oil price granger cause changes in unemployment (positive correlation) and GNP (negative correlation) in the US with the causality running from oil price shocks to the economic indicators. Thus positing that oil price surges are a contributing factor in atleast some of the US recessions. With the later oil price shocks and especially the negative shocks of the mid 1980s, the linear model failed to explain the granger causality. Mork (1989); Lee, Ni and Raati (1995); and Hamilton (1996) then employ a non-linear methodology to re-establish the relationship and maintain the granger causality.

Conversely, Blanchard and Gali (2007) in a study conducted on United State, France, United Kingdom, Germany, Italy and Japan demonstrate that the effects of oil price shocks on macroeconomic performance has decreased over time. Using a Structural VAR techniques, their results indicate that prior to 1984, a 10% increase in oil price would have reduced the US GDP by approximately 0.7% over a period of 2 to 3 years; while after 1984, it would do that by about 0.25%. They posit that the effects of oil price shocks must have coincided with a large shock of a different nature: large rise in other commodity prices in the 1970s and high demand as a result of growth of productivity with the rise of the emerging economies in the 2000s. They went further to list the pausible reasons for these declines which include decrease in real wage rigidities: a more flexible labour market, decrease in the share of oil in production and consumption, more credible monetary policies and the great moderation.

Although a bulk of the literature on developed economies has been on the US, using a VAR specification, Al-Salman, Ghali and Shammani (2008), researched on the short-run impacts of changing oil prices on the Group-of-Seven (G-7) economies. The granger causality test indicates that, in general, changes in oil price have impact on the real GDP across the G-7 countries. The empirical results also reveal that while the effects of oil price shocks are found to be significant for the G-7 countries, especially Germany and France, short term neutrality is observed in Italy, japan and the UK. Furthermore, government policies mitigate the consequences of oil price upsurge in Japan, Italy and France. A timing effect of surge in oil price on the business cycle of the G-7 economies was found. This is a reflection of the differences in responsiveness of the respective economies and the fact that the characteristics of some of the economies shape the influences of oil on them. For instance, an oil price surge has a long run impact on the US business cycle, permanent for Germany but short run impact on the business cycle of France and Canada.

1.4.2 Developing Economies

Even though much of the studies carried out on the implication of oil price shocks had concentrated on the net oil importers sizeable amount studies that focus on the net oil exporters have been springing up

Berument and Ceylan (2005) study the impacts of oil price shocks on the output growth of some selected Middle East and North African (MENA) countries which are either net importers or net exporters of oil but cannot affect its price employing a Structural VAR framework. Using the available real GDP data for each country under the study and the global price of crude oil, for the period of 1960-2003 they carried out the study on the impacts of oil price shocks on the afformentioned economies. The impulse response analyses indicate that effects of world oil prices on the GDP of Algeria, Iran, Iraq, Jordan, Kuwait, Oman, Qatar, Syria, Tunusia and United Arab Emirates are positive and statistically significant. Furthermore, the results suggest that a standard deviation shock in oil price has a significant, contemporaneous and positive effect on the growth of the aforementioned countries and dies out for the economic growth of Qatar, Syria and Tunisia after an additional year; while, lasting for additional four years for the remaining aforseaid economies. However, for Bahrain,

Egypt, Lebanon, Morocco and Yemen, the analyses reveal that the effects of oil prices on these economies are not statistically significant.

In a similar study, Kumar (2005) conducted a research on the impacts of oil price shocks on the growth of industrial production in India, one of the major emerging economies and an oil importer, over the period 1975-2004. He found that oil price shocks granger cause economic activities in India and have negative impacts on industrial production growth. The results indicate an asymmetric effect of oil price shocks on the growth of industrial production, revealing that a 100% rise in oil price causes a 1% drop in the growth of industrial production. The Variance Decomposition (VD) analyses suggest that oil price shocks caolesce with monetary shocks are the largest causes of volatility in industrial production growth other than the variable itself. Futhermore, the results reveal a positive relationship between real oil price surge and two economic indicators, inflation rate and short term interest rate, of India.

In a rather an usual study, WAMA (2008) attempts to investigate the impacts of oil price fluctuations on key macroeconomic convergence criteria (fiscal deficit and inflation) in ECOWAS member states, which are Sub-Saharan African economies. The VAR methodology was adopted and the sample countries include Nigeria, Ghana, the Gambia, Benin, Burkina Faso, Cote d'Ivoire and Senegal. The results indicate that oil price shocks lag for one year before affecting fiscal deficit in all the countries under study with the magnitute and direction of the responsiveness of the fiscal deficit differing across the countries. Nigeria, a major oil exporter for example, has a -1.83% responsiveness to a 1% rise in oil price; while Ghana, Cote d'Ivoire, Burkina Faso, Benin, the Gambia and Senegal have 0.05, 0.37, 0.86, 1.09, 1.27 and 1.53 respectively. This reveals that positive oil price shocks worsen fiscal deficit positions of oil importing countries. In terms of inflation the adverse effect of upsurge in the price of oil in the world oil market on the non-oil producing countries is limited unlike with fiscal deficit. This is attributed largely to efficient monetary policies adopted by the respective countries and to a lesser extend oil subsidy provided by the respective governments which deflects the transfer of the increase to final consumers.

In an attempt to investigate the the role of oil price shocks in predicting the phases of the South African business cycle associated with higher and lower growth

regimes; Balcilar, Eyden, Uwilingiye and Gupta (2014) carried out a study using a Bayesian Markov Switching Vector Autoregressive (MS-VAR) framework with data spanning the period 1960Q2 to 2013Q3. The regime-depended Impulse Response Functions (IRFs) reveal that the effect of oil price shocks on output growth in a high growth regime is statistically insignificant and short-lived. On the otherhand, the output response of oil price shocks during low regimes are positive, statistically significant and more persistent.

A recent research by Chen, Chen and Hardle (2014) on oil price shocks and the macroeconomy of China, focusing on international trade and utilizing the SVAR framework suggests that the rise in China's price level as a result of upsurge in world oil price is statistically less than that of its major trade partners. The countries included in their model are the OECD countries and the BRICS countries which are net oil importers and main trade partners of China. The results indicate that China's output level and price level are positively correlated with oil price and also surge in oil price leads to a slight depreciation in Renminbi (RMB). An upswell in the price of oil rises price level in China and its major trade partners with the magnitude being smaller for China; thus, making China's relative price positive which stimulutates the country's goods and service exports. The study, through the implicit assumption that the energy output ratio and the output energy ratio remain stable or move in the same direction and are independent of the relative price, also reveals that with the surge in oil price in the first decade of the millennium, demand by the country's main trade partners has decline or remain stable; whereas, China's demand rose steadily.

Cashin, Mohaddes, Raissi and Raissi (2014) using a GVAR model; encompassing over 90% of world GDP, 85% of world oil consumption, and 80% of world proven oil reserves; conducted a study on 36 countries and two regions consisting of both the oil importing and the oil exporting countries. Their aims were to distinguish macroeconomic effects of supply-driven oil price shocks from the demand-driven oil price shocks on the countries and regions under study. In addition to this, they study the persistence of the macroeconomic effects of the shocks across countries and the real as well as financial variables. The conclusion is that, a supply-driven oil price shocks has different macroeconomic consequences to a demand-driven oil price pertubation. Following a suppy-driven oil price surge, the oil importing countries

experience a long-lived decline in economic activity; while, the impact is favourable for the oil exporting countries with large proven oil reserves. In the case of the oil demand disturbance, cross countries differences are absent as the results indicate. The results reveal that almost all the countries included in the sample experience a long-run inflationary pressures, an increase in real output, a rise in interest rates, and a fall in equity prices.

Olomola (2006) investigated the impacts of oil price shocks on output, inflation, the real exchange rate and money supply in Nigeria using quaterly data from 1970-2004. Employing the VAR model, the results suggest that oil price shocks do not affect output and inflation substatianly in Nigeria. It is also revealed that inflation rate responds to shocks in output and money suppy rather than oil price shocks. However the findings demonstrate that volatility in oil price do affect the real exchange rate and is significant. As such an upsurge in oil price may squeeze the tradable sector giving rise to the "Dutch-Disease Syndrome". It is the manifestation of the volatility in the real exchange rate and money supply that leads to fluctuations of the aggregate economic activity proxied by GDP. As such, he concluded that oil price volatity is a key determinant of real exchange rate and in the long-run money supply, while money suppy impacts the growth of output in Nigeria.

In a similar study, Akpan (2009) looked into the the dynamic relationship between oil price shocks and certain key macroeconomic variables (real industrial output, proxies output; real effective exchange rate; real public expenditure; and inflation) in Nigeria, employing VAR framework and quarterly data from 1970-2007. Contrary to Olomola's (2006) finidings, the results reveal that oil price shocks, negative or positive, do affect inflation rate in Nigeria. The contrast could be attributed to the introduction of more variables. The results also indicate that an upsurge in the price of oil leads to increase in real national income through higher export earnings and an increase in government expenditure. It also leads to significant real exchange rate appreciation eventually leading to the "Dutch Disease" as ascertained by Olomola(2006). Output growth is found to be marginally affected by oil price fluctuations.

Aliyu (2009) examined the effects of oil price shocks on real economic activity in Nigeria using monthly data from 1980-2007. He conducted a Multivariate VAR analysis using both linear and non-linear specifications. In contrast to Olomola (2006) and Akpan (2009), he found the evidence of both linear and non-linear effect of oil price shocks on real GDP. He also found that in the non-linear specification, asymmetric oil price upswell has positive impact on real GDP growth with a larger magnitude than asymmetric oil price fall negatively affects the real GDP.

In an attempt to investigate the asymmetric impacts of oil price shocks on exchange rate and investment in Nigeria, Riman, Akpan and Offiong (2013) carried out a study over the period 1970-2010 using a VAR model. The results indicate that government expenditure is positively related to oil price shocks and reacts to the shocks immediately. On the other hand, industrial output, private investment and public investment are negatively correlated to shocks in oil price, demonstrating the existence of "Dutch Disease" syndrome in Nigeria. The VD technique analyses further reveal that exchange rate, government expenditure and domestic investment are affected primarily by oil price shocks, especially, in the short run.

Alley, Asekomeh, Mobolaji and Adeniran (2014) employed the General Method of Momentum (GMM) to investigate the impacts of oil price shocks on economic growth in Nigeria. Contrary to Aliyu (2009), their results suggest that oil price shocks do not have positive impacts on the economy. Oil price shocks insignificantly retard economic growth while oil price itself has positive impact on economic growth. The significant positive effect of oil price on economic growth of Nigeria corroborate to the theoritical ascertions that oil price increase is beneficial to net oil-exporting countries through rise in terms of trade. Oil price shocks, on the other hand, create uncertainty and undermine effective fiscal management of crude oil revenue; such as the negative effect of oil price shocks.

In a study conducted on 30 countries, both oil importers and oil exporters, over the period 1980-2011 using a Global VAR (GVAR), Allegret, Mignon and Sallenave (2014) attempted to trace the nature of transmission of oil price shock on glabal imbalances. They found out that demand-driven shocks effects differ substantially from the supply-driven shocks, and it has a weak impact on current account

imbalances. They conclude that the dynamics of energy exports and imports plays a key role in explaining global imbalances and the adjustment channels are the valuation channel (this implies a transfer of some of the increased wealth that accompanies oil price shocks from net oil exporters to net importers) which is short-lived, and the trade channel which is the main adjustment mechanism to oil price shocks explained by the interdependecies between countries.

CHAPTER II

METHODOLOGY

The comovements of macroeconomic variables across countries especially in output, inflation and interest rates have become more apace and conspicuous over the past two decades due to increased economic and financial intergration. Consequently, resulting in macroeconomic policy spillovers across countries (Smith et al, 2005). To understand such comovements and the economic implications of policy spillovers between Nigeria and other economies, specifically the ones emanating from oil price surge, GVAR modelling of the phenomena is adopted for this study. The model is explained below including the model sample period and size; variables employed, data source and types; and the specification and emprical estimation.

2.1 Sample period and Size

The study covers the period 1979Q2 to 2013Q1. The oil price shock of 1973, which was as a result of the Yom Kippur war, is not included because the developed and oil dependent economies learnt from it and embarked on policies, such as credible inflation-countering strategy, inventing fuel effecient machineries and the decline in real wage rigidities[4], that reduced their dependence on oil and the effect of oil price volatility on their respective economies. The GVAR model adopted for the study is customised and includes the major trade partners of Nigeria in terms of either import, export or from both directions from 1996 to 2013. The countries and region included are Brazil, China, India, Nigeria, South Africa, United Kingdom (UK), United States(US) and the Euro region which comprises of Belgium, France, Germany, Italy, the Netherlands and Spain.

2.2 Variables, Data Source and Types

The variables included in the GVAR model are real output (y), inflation (Dp), short term interest rate (r) and real effective exchange rate (epeps), based on consumer price index which are country-specific (domestic) variables. The global variable is oil price (poil) which enters in only the United States VARX* model as endogenous

4 See Blanchard and Gali (2010)

variable. All the other variables are included in the respective countries' and region's VARXs* both as domestic and the weakly exogenous foreign variables (also, foreign-specific variables are the starred variables: y*, Dp*, r* and epeps*) with the exception of epeps which enters the US VARX* as weakly exogenous foreign variable and enters other countries and region as domestic variable only. This is because the US dollar exchange rate is determined outside the US model. The weakly exogenous foreign short term interest rate (r) is not included in the US model given the importance of the US financial variables in the global economy, it is unlikely to be long-run forcing to the US-specific counterpart domestic variable. The foreign-specific variables, y*, Dp*, r* and epeps*, are constructed using trade weights obtained from the DdPS and International Monetary Fund(IMF) Direction Of Trade Statistics (DOTS).

More specifically the variables are computed as shown below,

$y_{it} = \ln(GDP_{it}/CPI_{it})$, $Dp_{it} = \ln(CPI_t) - \ln(CPI_{t-1})$, $r_{it} = 0.25 * \ln(1 + R^S_{it}/100)$

$epeps_{it} = \Pi_{j+i} \left[\frac{P_i R_i}{P_j R_j}\right]^{w_{ij}}$ and $W_{ij} = \frac{M_i}{M_i + X_i} S^i_j + \frac{X_i}{M_i + X_i} w^j_i$

Where GDP_{it} is the nominal gross domestic products, CPI_{it} is the consumer price index, $R^S_{it}$is the short term interest rate for country i at time t. W_{ij} is the competitiveness weight attached to country j by country i, M_i and X_i are country i's imports and exports, S^i_j is the share of country i's imports originating from country j, and w^j_i is the share of country i's export sold in country j. P_i and P_j are consumer price indices in countries i and j, and R_i *and* R_j represent the nominal exchange rate of countries i's and j's currencies in US dollars[5].

The method of data collection employed in this study involves the garthering of secondary data spanning the period 1979Q2 to 2013Q1. Data for all the countries and region with the exception of Nigeria were adopted from the GVAR 2.0 database. For Nigeria, all the data were sourced from the IMF International Financial Statistics (IFS) database. The data were linearly seasonally adjusted, and interpolated where required using Eviews 7.0 after which their respective logs are taken. All the data for Nigeria have 2010 as their base year. The real gross domestic product was retrieved in its

5 See Alessandro Zanello and Dominique Desruelle *A Primer on the IMF Information Notice* Working Paper WP/97/91 (New York, 1997), 12.

annual form so it was interpolated to get the quaterly data using constant sum average in Eviews 7.0[6]. Quarterly data of deposit rate per annum, collected from IMF/IFS, proxies Nigeria's short-term interest rate. Data for real effective exchange rate (epeps) for all the countries were gotten from the IMF/IFS database except where not available during some quarters, they were filled in with data from other sources. For Brazil and China, the data for epeps for the period 1979Q2 to 1979Q4 where filled in with data from GVAR 1.1 database. In the case of France, Italy, Spain and the US, data for the same period of 1979Q2 to 1979Q4 were completed with data from the world bank after interpolating them into quarterly data using constant sum average. The data for epeps covering the period 2004Q1 to 2013Q2 for India were completed with data from Business Intelligence Studies (BIS). The data for real broad effective exchange rate were obtained linearly seasonally adjusted as done by Dees et al. (2007) and the log taken. For the period of 1979Q2 to 1979Q4, the data for epeps for Nigeria were obtained from the Central Bank of Nigeria Statistical Bulletin.

The variables included in individual VARX* model of the GVAR are tabulated below in table 5.

Table 4 : Variables included in the GVAR

Variables	All countries/region excluding the US		US	
	Domestic	Foreign	Domestic	Foreign
Real GDP	y_{it}	y_{it}^{*}	$y_{us,t}$	$y_{us,t}^{*}$
Inflation	Dp_{it}	Dp_{it}^{*}	$Dp_{us,t}$	$Dp_{us,t}^{*}$
Short term rate	r_{it}	r_{it}^{*}	$r_{us,t}$	$r_{us,t}^{*}$
Real effective exchange rate	$epeps_{it}$			$epeps_{us,t}^{*}$
Oil price		$poil_{it}^{*}$	$poil_{us,t}$	

6 See Dees et al. 2007 where the annual GDP data for Saudi Arabia was interpolated into quarterly data using constant sum average.

2.3 Model Specification

The GVAR model[7] is presented as in Pesaran, Schuermann and Weiner (PSW) (2004); and Dees, di Mauro, Pesaran and Smith (DdPS) (2007a and 2007b). The GVAR model as developed by PSW 2004 and augmented by DdPS 2007 is a multi-country model that is built in three stages. The first step is to construct the conventional Vector Autoregressive (VAR) model and then it is extended by adding a set of weakly exogenous foreign variables (the starred variables) and making it the VARX*. The starred variables are computed using the weighted averages of same type of variables of all of a country's trading or financial partners as well as geographical relations. Additionally, global variables, which are common international factors such as oil price, are included in each coutry's model. In this, study bilateral trade is employed, following Baxter and Kouparitsas (2004) who postulated that trade is the most important source of inter-country business cycle linkages .

The next step is to estimate the model. In building as well as estimating the model, the lag structure and the number of variables included in it can vary amongst the countries. This flexibility gives the GVAR model a greater accuracy feature. In the third step, all the respective countries models are collected and a single VAR (GVAR) is estimated. The dynamic features of the model are used to show how shocks are transmitted across the countries.

2.3.1 Estimating Country-Specific VARX* Model

We begin by estimating individual country's Vector Autoregressive (VAR) model augemented by weakly exogenous foreign variables VARX*($p_i q_i$), where $p_i q_i$ are the lag order of the domestic variables and both foreign weakly exogenous variables and global variables I(1). Considering N+1 countries, indexed by i= 0, 1,2,3,.....,N, in the global economy where 0 serves as the reference country and each country i having country-specific variables which are related to foreign-specific variables and global variables including deternministic trend. The lag orders, $p_i q_i$, can vary amongst countries and are selected by mininimizing the Akaike Information Criterion (AIC) or using the Schwarz Bayesian Criterion (SBC). In this study, the AIC

[7] The formulation of the models followed PSW (2006), Galesi and Lombardi (2009), and de Waal and van Eyden (2013)

is being employed and the maximum lag order set to 2. Two is chosen because of the data limitations (the observations for the study are 40) as a higher lag order requires much larger observations[8].

The VARX*(2,2) framework with country-specific variables, foreign-specific variable, global variables, constant(intercept) and a trend is presented below,

$$x_{it} = a_o + a_{1t} + \delta_{i1}x_{i,t-1} + \delta_{i2}x_{i,t-2} + \Lambda_{i0}x^*_{it} + \Lambda_{i1}x^*_{i,t-1} + \Lambda_{i2}x^*_{i,t-2} + \Gamma_{i0}d_t + \Gamma_{i1}d_{t-1} + \Gamma_{i2}d_{t-2} + u_{it} \quad (1)$$

where i= 1,2,3,.....N and t= 1,2,3,.....T. x_{it} is a $k_i \times 1$ vector of country-specific domestic variables for country *i*, x^*_{it} is a $k_i^* \times 1$ vector of foreign-specific variables of country *i*, a_o is $k_i \times 1$ a vector of fixed intercept coefficients, a_{1t} is a $k_i \times 1$ vector of coefficient of deterministic time trend, δ_{i1} and δ_{i2} are a $k_i \times k_i$ matrix of coefficients associated to the lagged domestic variables, Λ_{i0}, Λ_{i1} and Λ_{i2} are $k_i \times k_i^*$ matrices of coefficients associated with contemporaneous and lagged foreign variables respectively, d_t is a set of common global variables assumed to be weakly exogenous in the global economy with the exception of th US economy where it is included as endogenous, Γ_{i0} and Γ_{i1} are the matrices of fixed coefficients of the global variables. u_{it} is a process with no serial correlation but with weak dependency across sections. $k_i \times k_i^*$ might vary relative to a country.

To construct the foreign variables, fixed trade weights or time-varying trade weights are employed to compute the foreign variables as weighted averages of corresponding domestic variables. The foreign variables are computed as,

$$x^*_{it} = \Sigma_{j=0}^{N} w_{ij}x_{ij}$$

where w_{ij} are trade weights which show the trade share of country *j* (where *j*=1, 2, 3,.....N) in the trade of country *i* (average of imports and exports). The weights are predetermined and satisfy the condition $\Sigma_{j=0}^{N} w_{ij} = 1$ and $w_{ii} = 0$ (ie, the summation of trade of country *i* with its *j* partners is 1, while the trade with itself adds up to 0).

[8] See DdPS (2007)

The number of cointrgrating relations are also determined which show the long-run relations of the variables. To determine it, a Vector Error Correction (VEC) model augemented with foreign variables (VECX*), which includes both the short-run and long-run relations, is presented as shown below,

$$\Delta x_{it} = c_{i0} - \alpha_i \beta_i' \left[z_{i,t-1} - \gamma_i (t-1)\right] + \Lambda_{i0} \Delta x_{it}^{*} + \Gamma_i \Delta z_{i,t-1} + u_{it}, \quad (2)$$

where $z_{it} = (x_{it}', x_{it}'^{*})$

α_i is a $k_i \times r_i$ matrix with speed of adjustment coefficients and β_i is a $(k_i + k_i^{*}) \times r_i$ matrix of the cointegrating vectors. The rank of both α_i, β_i is r_i. The r_i error-correction terms of equation (2) can be rewritten as

$$\beta_i' (z_{it} - \gamma_{it}) = \beta_{ix}' x_{it} + \beta_{ix^*}' x_{it}^{*} - (\beta_i' \gamma_i)_t, \quad (3)$$

if β_i is partitioned as $\beta_i = (\beta_{ix}', \beta_{ix^*}')'$. Then, cointegration is possible in x_{it}, between x_{it} and x_{it}^{*}, and between x_{it} and x_{jt} when $i \neq j$.

During the estimation of the VECX* models for each country, x_{it}^{*} is treated as long-run forcing for domestic variables, which means that foreign variables affect domestic variabes in the long term but the domestic variables do not affect foreign variabes in the long run. However, contemporaneous correlations between the variables are permitted.

2.3.2 GVAR Model

Once the individual country's VARX* are estimated, they are stacked together together to build the GVAR model, solving all the economies' endogenous variables $(k = \Sigma_{i=0}^{N} k_i)$ simultaneously in the global system.

$$A_{i0} z_{it} = a_{i0} + a_{i1t} + A_{i1} z_{i,t-1} + A_{i2} z_{i,t-2} + u_{it}, \quad (4)$$

with $A_{i0} = (I_{ki}, -\Lambda_{i0})$, $A_{i1} = (\Phi_{i1}, \Lambda_{i1})$ and $A_{i2} = (\Phi_{i2}, \Lambda_{i2})$.

Then derive the identity $z_{it} = W_i x_i$, (5)

where $x_t = (x_{0t}', x_{1t}', \ldots\ldots, x_{Nt}')$ is a $k_i \times 1$ vector of endogenous variables and W_i is a $(k_i + k_i^*) \times k$ link matrix. W_i is constructed from the country-specific trade weights w_{ij}. Use the identity to rewrite equation (4) into

$$A_{i0}W_i x_t = a_{i0} + a_{i1t} + A_{i1}W_i x_{t-1} + A_{i2}W_i x_{t-2} + u_{it} \qquad (6)$$

For a model of the endogenous variable x_t, the individual country models are stacked together to obtain

$$G_0 x_t = a_0 + a_{1t} + G_1 x_{t-1} + G_2 x_{t-2} + u_t, \qquad (7)$$

where

$$G_0 = \begin{bmatrix} A_{00}W_{00} \\ A_{10:}W_1 \\ A_{N0}W_N \end{bmatrix}, a_0 = \begin{bmatrix} a_{00} \\ a_{10} \vdots \\ a_{N0} \end{bmatrix}, a_1 = \begin{bmatrix} a_{00} \\ a_{10} \vdots \\ a_{N0} \end{bmatrix}, G_1 = \begin{bmatrix} A_{01}W_0 \\ A_{11} \vdots W_1 \\ A_{N1}W_N \end{bmatrix},$$

$$G_2 = \begin{bmatrix} A_{02}W_0 \\ A_{12:}W_1 \\ A_{N2}W_N \end{bmatrix} \; and \; u_t = \begin{bmatrix} u_{0t} \\ u_{1t} \vdots \\ u_{Nt} \end{bmatrix}$$

Equation (7) is then premultiplied by G_0^{-1}, since G_0 is a known non-singular matrix. The GVAR(2) model is

$$x_t = b_0 + b_{1t} + F_{1t}x_{t-1} + F_2 x_{t-2} + \varepsilon_t, \qquad (8)$$

where $b_0 = G_0^{-1}a_0, b_1 = G_0^{-1}a_1, F_1 = G_0^{-1}G_1, F_2 = G_0^{-1}G_2$ and $\varepsilon_t = G_0^{-1}u_t$.

This model is solved recursively, usually with no restrictions on the covariance matrix $\Sigma_\varepsilon = \mathrm{E}(\varepsilon_t \varepsilon_t')$.

The idiocyncratic shocks ε_t are correlated across countries/regions. More specifically,

$$\mathrm{E}(\varepsilon_{it}\varepsilon_{jt}') = \begin{cases} \Sigma_{ij} & for\ t \neq t' \\ 0 & for\ t \neq t' \end{cases}$$

Therefore, the GVAR model allows for interdependence through three channels:

- Contemporaneous interrelations of domestic variables, x_{it}, with foreign-specific variables, x_{it}^{*}, and their lagged values;
- the dependence of domestic variables, x_{it}, on global variables, d_t, and their related lagged values;
- the contemporaneous dependence of shocks in country *i* on the shocks in country *j*, u_t.

To estimate the GVAR model, trade weights are computed which are used to construct the country-specific foreign variables. With regard to this study, these are the trade shares amongst countries which show the share of trade between Nigeria and her major trade partners included in the study. Fixed trade weight is adopted for the study on the grounds that the changes in the trade weights tend to be gradual and the countries included have been Nigeria's major trade partners atleast since mid 1990s. The trade data used cover the period 1980 to 2013. The weight is computed as the average of import and export of bilateral tarde between countries based on US dollar GDPs. The Impulse Response Functions (IRFs) are aggregated using weights based on the Purchasing Power Parity (PPP) valuation of country GDPs between 2009 to 2011.

2.3.3 Test for Weak Exogeneity

Country-specific foreign and the common global variables, x_{it}^{*} and d_{it}, are assumed to be weakly exogenous, meaning that they are long-run forcing for the domestic variables. Except, for the case of US, treated as the dominant economy, the common global variable, here oil price, is treaded as endogenous variable. A formal test on x_{it}^{*} and d_{it} is conducted as described in Johansen (1992) and Harbo et al. (1998). The test involves testing for joint signicance of the estimated error correction terms in auxilliary equation of x_{it}^{*} as presented below,

$$\Delta x_{it}^{*} = \mu_{il} + \sum_{j=1}^{r_i} \lambda_{ij,l}\, ECM_{i,t-1}^{j} + \sum_{k=1}^{s_i} \theta_{ik,l} \Delta x_{i,t-k} + \sum_{m=1}^{n_i} \vartheta_{im,l} \Delta x_{i,t-m}^{\epsilon *} + \varepsilon_{it,l}$$

For each *lth* element of x_{it}^{*} the above regression is conducted.

$ECM^{j}_{i,t-1}$ are the estimated error terms corressponding to the r_i cointegrating relations found for the *ith* country model and j= 1,2,3....., r_i. The test for weak exogeneity is an F-test of the joint hypothesis that $\lambda_{ij,l}$ = 0 and j = 1,2,3....., r_i. The lag orders s_i *and* n_i do not need to be same as the p_i *and* q_i orders of the underlying country-specific VARX*. In the study, it is estimated at 5% level of significance.

2.3.4 Unit Root Test

Unit root test is performed on the the variables included using weighted Symmetric estimation of Augmented Dickey-Fuller (WS) as introduced by Park and Fuller (1995). The test exploits time reversibility of stationary autoregressive processes in order to increase their power performance. The lag length used in WS unit root test is chosen by the AIC based on standard Augmented Dickey-Fuller (ADF) regressions. AIC is chosen to choose the lag orders as it profers more lags hence reducing serial correlation in the model.

2.3.5 Cointegrating Vectors

The rank of the cointegrating space for each country or region is estimated using Johansen's trace statistcis and maximum eigenvalue statistics for models with weakly exogenous I(1) regressors as reported by Paseran et al. (2000). Since Trace statistics has superior performance in smaller samples, it is selected in this study.

2.3.6 Persistence Profiles (PP)

This was developed by Lee and Pesaran (1993) and Pesaran and Shin (1996). Persistence Profiles (PP) demonstrate movements in the cointegrating vectors after a shock to the sysem. Persistence Profiles converge to zero in the long term, illustrating that the system returns to its long-run equilibrium. GVAR returns a 40-quarter period or a ten-year period over which the PP is to converge to zero. If it does not converge to zero, it is thought that there is some misspecification in the model as presented by Smith (2011). Thus it investigate the stability of the model.

To estimate the Persistence Profile the resercher follows Dees et al.(2007)[9] where the PP of the cointegrating relations in terms of a country-specific variables, , $\Pi_i^{'} z_{it}$, with respect to a system-wide shock to the GVAR model ε_t is given by

$$PP\left(\Pi_{ji}^{'} z_{it}; \varepsilon_{it}, n\right) = \frac{\Pi_{ji}^{'} W_i B_n \Sigma_\varepsilon B_n^{'} W_i^{'} \Pi_{ji}}{\Pi_{ji}^{'} W_i B_0 \Sigma_\varepsilon B_0^{'} W_i^{'} \Pi_{ji}}, n = 1,2,3 \ldots \ldots$$

where $\Pi_{ji}^{'}$ is the j^{th}cointegrating relation in the i^{th} country (j= 1,2,3,....., r_i) n is the horizon, Σ_ε is the covariance matrix of the ε_t and $B_0 = S_0 A_0, and\ B_n = S_0 A_n - S_1 A_{n-1}$

$(S_0 A_n - S_1 A_{n-1})$ is derived from equation (5),

$z_{it} = W_i x_i = W_i (S_0 A_n - S_1 A_{n-1})$.

The PP of $\Pi_{ji}^{'} z_{it}$ with respect to a variable specific shock, say l^{th} element of x_t is given by,

$$PP\left(\Pi_{ji}^{'} z_{it}; \varepsilon_{lt}, n\right) = \frac{\Pi_{ji}^{'} W_i B_n \Sigma_\varepsilon \Pi_{ji} e_l}{\sqrt{\sigma_{ll}}}, n = 1,2,3 \ldots\ldots$$

where σ_{ll} is the l^{th} diagonal of Σ_ε and e_l is a $k \times 1$ selection vector with its element corresponding to the l^{th} variable in x_t is unity and zeros elsewhere.

2.3.7 Structural Breaks

Although individual VARX* model is specified conditional on foreign variables that would help reduce if not remove structural problems, the GVAR framework could still suffer the problem of structural break. This is especially the case for emerging economies which face political and social changes. Short-run structural stability test is conducted in the study given the sample size, obsevations included and time series data constraint, which makes long-run test of structural breaks not feasible. The structural stability test conducted in the study is on the residuals of the individual country's VECX* so as to obtain a the short-run coefficient that is not different from the exact identification of the long-run relations. As presented by Dees et al. (2007), the tests conducted for strutural stability include Ploberger and Kramer's (1992) maximal OLS cumulative sum (CUSUM) statistic, denoted by PKsup and its mean square variant PKmsq. Also considered are tests for parameter constancy against non-stationary alternatives proposed by Nyblom (1989), denoted by $\Re$, as well as

[9] For detailed derivation of persistence Profile, see Dees et al. (2007), "Long Run Macroeconomic relations in the Global Economy", The Open Access, Open Assessment E-Journal, No.2007-3. PP 9-10

sequential Wald-type tests of a one-time structural change at an unknown change point. The latter include the Wald form of Quandt's (1960) likelihood ratio statistic (QLR), the mean Wald statistic (MW) of Hansen (1992) and Andrews and Ploberger (1994) and the Andrews and Ploberger (1994) Wald statistic based on the exponential average (APW). The heteroskedasticity-robust version of the above tests is also presented.

2.3.8 Impact Elaticities

To measure the impact elasticity, which is the feedback, of foreign-specific variable to its domestic counterpart; the contemporaneous effects of the foreign variables on their domestic counterparts are estimated. The effects or response or elastiticies are used with robust t-ratios which is computed using White's heteroscedasticity-consistent variance estimator. It shows the magnitude of change in percentages of a domestic variable as a result of a change in a counterpart foreign variable. It provides information on the comovements between foreign variables and their domestic counterparts. This is particularly important in understanding the relation between the foreign and domestic variables included in the model.

2.3.9 Generalised Impulse Response Analysis

Generalised Impulse Response Functions (GIRFs) investigate the propagation of shocks in the system. GIRFs are invariant to ordering of countries in the model, as such in a multi-country framework with no a priori knowlegde of ordering the variable, GIRFs have the highest identification and investigation power. The GIRFs employed in the study is that proposed in Koop et al. (1996) and further developed by Pesaran and Shin (1998) to investigate the dynamic features of the GVAR estimated. GIRFs report the impact of a standard error unit shock on other variables in the model on all the variables in the system, the variable from which the shock is propagated inclusive.

CHAPTER III

EMPIRICAL FINDINGS, ANALYSIS AND INTERPRETATIONS

The empirical results of the GVAR model and other tests carried out in the study as described in chapter three above are presented here. The variables included are reported in chapter three. The computed as well as estimated findings are analysed and interpreted in line with Pesaran et al. (2004), Pesaran et al. (2006) and Dees et al. (2007).

3.1 Trade Weight

The trade shares used to build the country-specific foreign variable are depicted in the the table below. The data span the period 1980 to 2013 and were obtained from the IMF DOTS for Nigeria's trade with her partners and her partners trade with her, in annual form. Trade amongst other economies were obtained from DdPS, 2007.

Table 6: Trade Weight

Country	Brazil	China	Euro	India	Nigeria	South Africa	United Kingdom	USA
Brazil	0	0.069263	0.04987	0.033619	0.080394	0.02418	0.013132	0.056635
China	0.294199	0	0.275995	0.277895	0.095478	0.252207	0.103486	0.425762
Euro	0.322285	0.35878	0	0.302535	0.301204	0.354761	0.668229	0.335585
India	0.039813	0.065461	0.050284	0	0.119972	0.08163	0.024347	0.045675
Nigeria	0.040389	0.009111	0.022807	0.057589	0	0.037001	0.007408	0.030201
South Africa	0.011003	0.030604	0.027237	0.050055	0.034032	0	0.025827	0.012858
United Kingdom	0.038982	0.054071	0.315727	0.06135	0.043612	0.098119	0	0.093284
USA	0.253329	0.41271	0.25808	0.216956	0.325308	0.152102	0.157571	0

Source: Computed by the reseacher using GVAR 2.0

The table above displays the trade weights of the countries and region included in the GVAR model of the study. The trade weight is computed as the share of export and import of individual country/region with its partner depicted in column such that a column and not a row adds up to one.

We can deduce from the table above that the US trade dominates other region/countries included in the model in terms of trade with Nigeria. It accounts for 33% of the trade with Nigeria. It is followed by the Euro which accounts for approximately 30% of the total trade with Nigeria. India and China fall behind Euro

reporting about 12% and 10% respectively. In total the three countries and the Euro area are responsible for 85% of trade with Nigeria in the model.

Although a major oil exporter whose distruptions in oil production and supply had affected world oil supply, Nigeria's share of world trade is small as explained in Chapter two. This is evident in the trade weight reported above. Nigeria accounts for approximately 3%, 2%, 1%, 4%, 1% and 1% of the trade with the US, Euro, India, China, Brazil, Uk and South Africa respectively in the model.

3.2 Weak Exogeneity Test

The weak exogeneity test of the country-specific foreign variables and the global variable in relation to the long-run parameters of the conditional model used in building the GVAR framework is carried out here. As stated earlier, the test is in line with Johansen (1992) and Harbo et al (1998). The test is an F-test and the results together with the 95% critical values are reported in table 7 below.

Table 7 : Test for Weak Exogeneity at the 5% Significance Level

Country	F test	Fcrit_0.05	ys	Dps	rs	epepss	poil
Brazil	F(2,116)	3.074447	1.896779	2.262977	0.383802	-	0.338684
China	F(2,116)	3.074447	0.038974	0.398465	0.662356	-	1.333617
Euro	F(2,122)	3.070512	1.680165	1.946589	3.013404	-	1.345728
India	F(1,123)	3.918178	0.568484	0.290919	0.01802	-	5.872643*
Nigeria	F(3,121)	2.679535	0.753641	0.332512	1.638855	-	1.858297
South Africa	F(2,122)	3.070512	0.035817	0.571735	1.849015	-	0.292684
United Kingdom	F(1,123)	3.918178	0.66721	0.273676	0.008648		0.310947
USA	F(2,119)	3.072429	3.51507*	0.742825	-	7.611291*	0.082824

Source: Computed by the reaseacher using GVAR 2.0

From table 7 above, it can be seen that the weak exogeneity assumption is accepted for all the variables except the global variable, poil, in the Indian model; and real effective exchange rate (epeps), and real GDP in the United States VARX* model. In the table, the variables that are statistically significant at the 5% level, that is rejected , are the starred variables. Given the significance level assumed here, even if the weak exogeneity assumption were true in all cases, we would expect up to 5% rejections of the total test (Cashin et al., 2012). We can observe that 3 obervations are statistically significant which is a little more than 5% of the total 31 observations but

small as such we still accept the weak exogeneity of the foreign and global variables included in the model[10]

3.3 Unit Root test

Specifying the GVAR model for the study follows PSW (2004) and Dees et la. (2007) where, the variables included in the country-specific models are assumed to be integrated of order one, I(1). This allows the identification of short-run relations from long-run relations and interpreting the long-run relations as cointegrating. Unit root test is used to examine the the properties of both the domestic and foreign variables included in country-specific model. As stated earlier in charpter three, the unit root t-statistics is based on the weighted symmetric estimation of ADF type regression and the lag length are selected by AIC.

The results of the tests based on regressions, including both intercept and linear trend and the regression including only intercept and no trend for all the variables, are reported in tables A, B and C of the appendix. The tests have critical values of 95%, which are -3.24 and -2.55 for regressions with trend and regressions without trend respectively. The results of the tests reported agree with the unit root hypothesis except for very few cases where the hypothesis is rejected. With regards to the domestic variables, the unit root hypothesis for real effective exchange (epeps) rate for South Africe is rejected. Also the domestic short-term interest rate(r) for India, UK and the US are rejected. Futhermore, for India, Nigeria and South Africa, the unit root hypothhesis for inflation is rejected. In the sphere of the foreign variables, real output is rejected for Brazil, EU and India. The unit root hypothesis is also rejected for inflation in the South African model. In line with PSW (2004), since over differencing of inflation is likely to be less serious of a specification error than wrongly including an I(2) variable, inflation is added as an I(1) variable

3.4 Lag Order Selection and Cointegrating Relations

Once the variables to be included in individual country-specific model are stated, the corresponding VAR models are estimated and the rank of their cointegrating

[10] see Mohaddes and Pesaran, (2016), " Country-Specific Oil Supply Shocks: A Counterfactual Analysis, where 11 out of 158 obsevations are statistically significant at 5% but the weak exogeneity for both foreign and global variables are accepted

space solved. The lag order are selected by AIC with the researcher setting the maximum lag of 2 for both the domestic and foreign variable (p_{max_i} and q_{max_i} respectively) as described above due to data limitation.

The result of the VARX* order and the cointegrating rank are presented in table 8 below,

Table 8: VARX* Lag Order and the Number of the Cointegraing Relations

Country	VARX* Lag Order		Cointegrating Relations (r_i)
	p_i	q_i	
Brazil	2	1	2
China	1	1	2
Euro	2	1	2
India	1	2	1
Nigeria	2	1	3
South Africa	2	1	2
United Kingdom	2	2	1
United States	2	2	2

Source: Computed by the resaercher using GVAR 2.0

The cointegrating statistics are based on Trace Statistics with 95% Critical value. It can be deduced from the table above that the AIC favours the VARX*(2,1) for most countries and region included in the study. These countries and region include Brazil, Euro, Nigeria and South Africa. It favours a VARX*(1,2) for India, VARX*(1,1) for China; and VARX*(2,2) for UK and US. The number of long-run relations are presented in the last column of the table with Brazil, China, EU, South Africa and US each having 2. India and UK each has 1 while Nigeria has 3. The orders of the VARX* models including the cointegration relationships and diagnostic tests results are appended, as table D in the appendix.

3.5 Persistence Profile (PP)

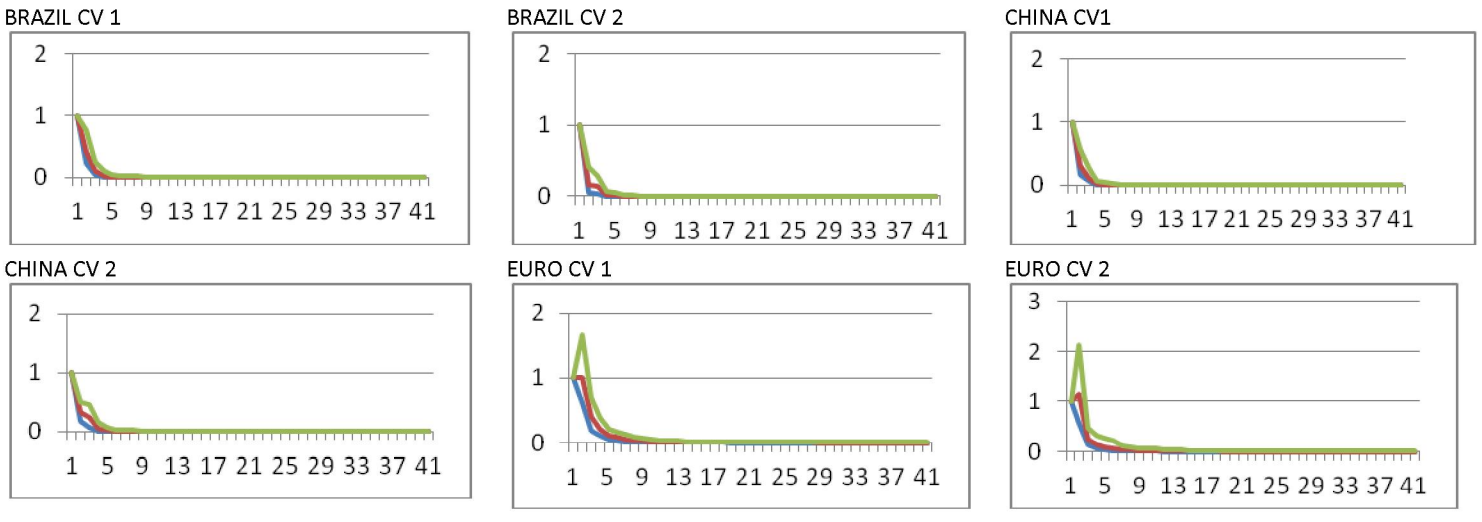
Having specified the individual country VARX* model, the next step is to investigate how a system-wide shocks on the identified cointegrating vectors lasts and if it dies out or not. To do so, the Persistence Profile test is employed. This exposes the stability of the model. On impact, the Persistence Profile is normalised to take the value of 1. The rate at which they converge to zero, provides information on the speed at which correction takes place after a shock and returns to equilibrium. In some cases

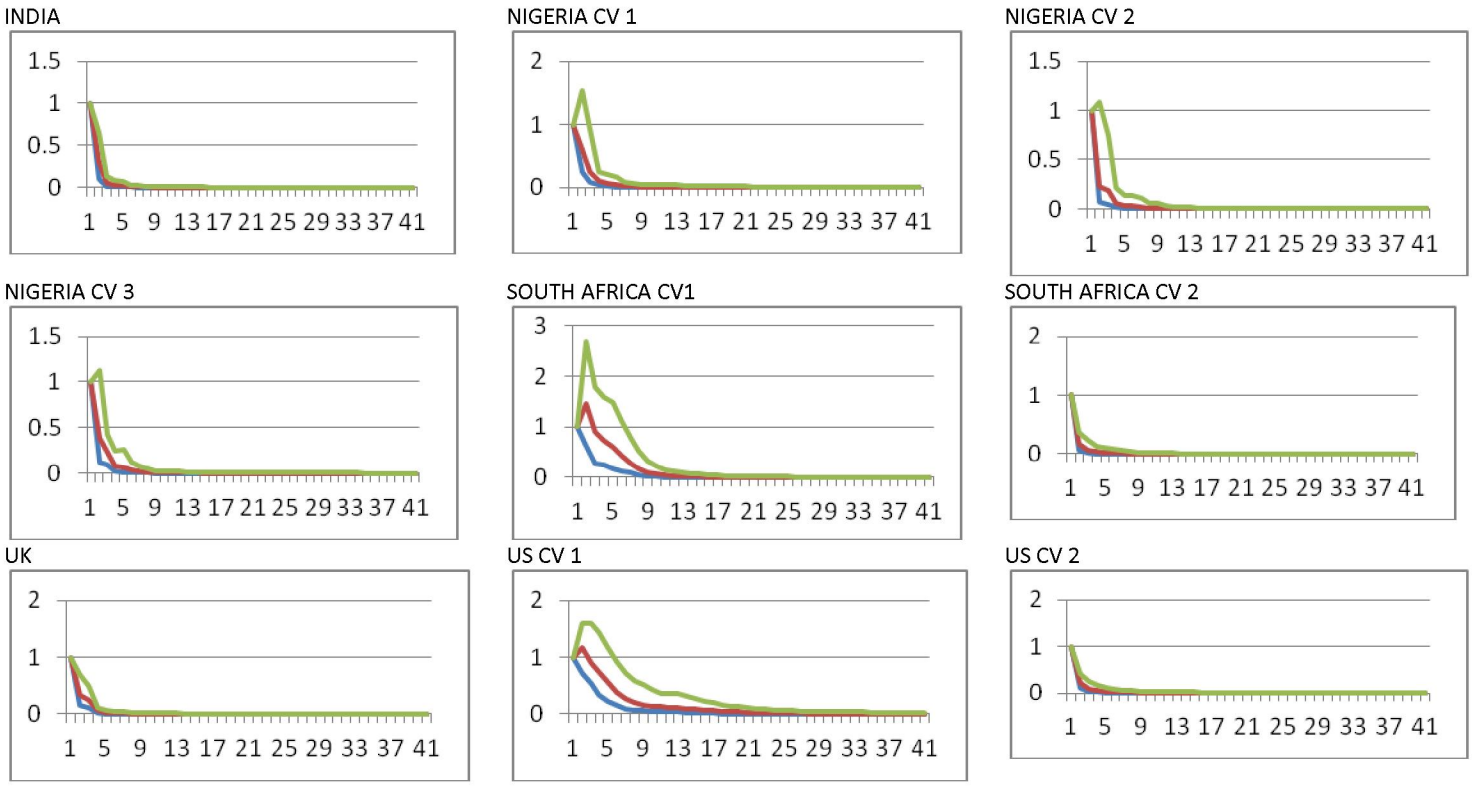
the PP could overshoot thereby exceeding unity and also the speed of adjustment could be slow. But even in such instances it must die out and approach zero otherwise the model is considered as unstable and it has to be reestimated using lower cointegrating relations.

The graphs of the Persistence Profiles of the cointegrating relations reported in table 8 above are presented below with their 95% boostrapped error band.

The middle line is the median effect of a shock to the model and its cointegrating relations while lower and upper lines show the lower and upper boostrapped confidence bounds respectively of 95%. In a total of 15 cointegrating vectors, only EU's CV2, South Africa's CV1 and US's CV1 have profiles that overshoot. This adjusted for EU faster than South Africa and the US by 12 months. The convergence rate is high as the models converge and reach equilibria quickly. Out of the 15 cointegrating vectors, 8 converge to equilibria in approximately 5 months or less. Brazil shows the fastest rate of convergence of 4 months, while US shows the slowest of 24 months (approximately 6 years).

Figure 2: Persistence Profiles of the Estimated Cointegrated Vectors





To buttress the proof provided above by Persistence Profile that the global model estimated is stable, the enginvalues of the GVAR model is estimated. The results are reported in table E of the appendix and it reveals that the GVAR model is stable as no value of the enginvalues of the GVAR model exceeds unity.

3.5 Structural Stability Test

Structural stabilty is important when dealing with cointegrated models. The test checks for structural break and test the structural stability of the short-run coefficients as stated earlier. The tests carried out are Ploberger and Kramer's (1992) maximal OLS cumulative sum (CUSUM) statistic, denoted by PKsup and its mean square variant PKmsq. Also considered are tests for parameter constancy against non-stationary alternatives proposed by Nyblom (1989), denoted by $\Re$, as well as sequential Wald-type tests of a one-time structural change at an unknown change point. The latter include the Wald form of Quandt's (1960) likelihood ratio statistic (*QLR*), the mean Wald statistic (*MW*) of Hansen (1992) and Andrews and Ploberger (1994) and the Andrews and Ploberger (1994) Wald statistic based on the exponential average (*APW*).

With the exception of PKsup and PKmsq, the heteroskedasticity-robust version of all the tests is also conducted. The results of the tests by variables at 5% significance level are summarised in table 9 below; and table F in the appendix presents the break dates with Quandt's Likelihood Ratio (QLR) at 5% significance level.

Table 9 : Number of rejections of the null of parameter constancy per variable

	Variabes				
Alternative Test	Number (%)				
	y	Dp	R	epeps	Total
PK sup	0(0.00)	2(0.25)	2(0.25)	0(0.00)	4(0.13)
PKmsq	1(0.13)	1(0.13)	1(0.13)	0(0.00)	3(0.10)
Nyblom	2(0.25)	2(0.25)	2(0.25)	2(0.29)	8(0.23)
Robust Nyblom	0(0.00)	0(0.00)	1(0.13)	2(0.29)	3(0.10)
QLR	0(0.00)	2(0.25)	3(0.38)	3(0.43)	8(0.26)
Rosbust QLR	1(0.13)	0(0.00)	4(0.50)	0(0.00)	5(0.16)
MW	2(0.25)	3(0.38)	2(0.25)	2(0.29)	9(0.29)
Robust MW	1(0.13)	0(0.00)	2(0.25)	0(0.00)	3(0.10)
APW	1(0.13)	2(0.25)	3(0.38)	3(0.34)	9(0.29)
Robust APW	2(0.25)	0(0.00)	3(0.38)	0(0.00)	5(0.16)

Source: Computed by the resercher using GVAR 2.0

As in Dees et al. (2007), the critical values of the tests, computed under the null of parameter stability, are computed using the bootstrap samples obtained from the solution of the GVAR model. From the table above, Number and (%) represent the number and percentages of rejections per variable for individual test and for the whole variables under each test as presented in the Total column. The results vary across tests with the PKsup and PKmsq returning the lowest numbers of rejections, 4 and 3 respectively, with the exception of the robust tests. $\Re$, QLR, MW and APW reported higher rejection cases that range between 8 and 9, but their robust tests returned lower statistics that range between 3 and 5. Taken into consideration the robust nature of the results, it could be deduced that the main reason of the rejection is break in the error variance and not the parameter coefficients as found by Dees et al. (2007)[11]. Overall, the model appears stable. Any evidence of instatibiltiy can be limited to the error variance. To overcome such problem, the robust standard errors is employed when testing how the foriegn variables impact the remaining variables. Also, the generalised impulse response with boostrap means and confidence bounds rather than the point estimates is estimated and interpreted.

[11] See Table F in the Appendix for the Break Dates for QLR Tests

3.6 Impact Elasticities

As stated previously, the percentage impact of a foreign variable on its domestic counterpart in the contemporary is estimated through the estimation of the cointegrating VARX* models. The contemporaneous effects of foreign-specific variables on all the domestic variables of all the countries included in the model were computed using White's heteroscedacity-cosistent variance estimator as in Dees et. al (2007). The results, showing the estimated coefficients of the contemporaneous foreign variables in country-specific models and the their respective White's heteroscedacity robust t-ratio in brackets, are presented in table 10 below

Table 2 : Contemporaneous Effects of Foreign Variable on their Respective Domestic Counterparts

	Domestic Variables			
Country	y	Dp	r	epeps
Brazil	0.19	-1.34	0.46	
	(0.71)	(-0.35)	(0.03)	
China	0.24	0.38	-0.01	
	(0.90)	(3.00)	(-0.40)	
Euro	0.40	0.18	0.02	
	(4.22)	(3.84)	(2.05)	
India	0.03	0.20	-0.01	
	(0.11)	(1.37)	(-0.46)	
Nigeria	-1.34	-0.09	0.10	
	(-3.10)	(-0.23)	(3.00)	
South Africa	0.24	0.33	0.04	
	(2.52)	(2.13)	(1.12)	
United Kingdom	0.63	0.47	0.05	
	(5.49)	(3.31)	(0.83)	
USA	0.20	0.075		
	(2.08)	(2.75)		

Source: Computed by the reseacher using GVAR 2.0

From the table above, it can be seen that the domestic ouput variables of all countries included in the model share positive relationships with their foreign counterparts with the exception of Nigeria which exhibits negative relation. With the magnitudes being different for each country/region. This is in line with the findings of Dees et al. (2007) and Cesa-Bianchi et al. (2011 and 2012) which reveal positive relationships for the major advanced countries with large magnitudes. This

demonstrates how open an economy is. The high percentage is due to the openness of the Euro area. Nigeria has the highest magnitude of more than -1, which shows over reaction, in terms of comovements between her foreign output variables and her domestic variable. This could be attributed to the country's high percentage of imports, where it imports almost all that it uses in the production sector as well as consumer goods which means that her domestic output production shrinks with increase in output of her major trade partners. More aptly put, with the increase in output of the major trade partners, the outputs become cheaper which induces more demand for import by Nigeria, thereby resulting in dwindling of domestic production. This is evidence in the textile industry which continually shrinks due to the introduction of cheaper and nearly identical, in design, textile materials from China.

With regards to inflation, the advanced countries domestic inflation does not respond to foreign inflation significantly. The US for instance reports the lowest elasticity of approximately 0.08%. This confirms the conviction that inflation is unidirectional with regards to advanced economies. As such, the inflation of these economies can be transmitted to other economies especially the less advanced economies but cannot be transmitted to the advanced economies. The domestic inflation of Nigeria has a negative relationship with the foreign counterpart, reporting an elasticity of 0.09. This means that with a 1% rise in foreign inflation, Nigeria's inflation falls by 0.09%.

The short term interest rate returns very low elasticities. The low coeffecients of this variable show weak monterary policy reactions among the economies with the exception of Brazil (0.46%) follows by Nigeria. Nigeria's domestic short-term interest rate shows a relatively significant comovement with its foreign counterpart of 0.10% for every 1% change in the foreign variable. This demonstrate how expose Nigeria is to the domestic monetary policies of her trade partners.

Overall, the contemporaneous effects of the foreign variables on the domestic variables presented above show how expose Nigeria is and to what degree of volalities in the world especially from the country's major trade partners, countries included in the model, affect the country. Table G in the appendix shows the full results of the tests

conducted including the standard error, t-ratio and the White's heteroscedacity standard errors.

3.7 Generalized Impulse Response Functions (GIRFs) Analysis

To analyse the dynamic nature of the GVAR model, how shocks are transmitted from world oil market and from one economy to another as well as how long it takes before the shocks die out, GIRFs is employed. The discussion of the results focus on two years, the short-term, although the graphs present up to 10 years, 40 quarters. The presentation of the remaining quarters is to reveal when an economy returns to equilibrium after an external shock from the global oil market and its trading partners that has impacts on the economy. Two years is a reasonable time horizon over which the model reveals plausible results[12] for short-run dynamics. To avoid the problem of changing error variance, all the GIRFs figures analysed were computed using sieve bootstrap as in the case of structural stability and are thus presented with their bootstrap estimates and their associated 90% confidence bounds.

Since the study focuses on Nigeria, the interpretations of the GIRFs of Nigeria are done. Also as the study focuses on shocks propagated from Nigeria's trade partners to Nigeria, only the GIRFs graphs of the respective economies under consideration with respect to shocks in any particular variable to Nigeria are presented and analysed here. Also the implication of four different external shocks are examined. These are:

- A one standard error negative shock to the output of all of Nigeria's trade partners, the economies included, on Nigeria. Given the fact that oil; which accounts for 90% of Nigeria'a exports revenue, 85% of government revenue and 35% of GDP (OPEC, 2015); is a production input to all of the Nigeria's trade partners included in the model. As such, a negative shock in any of the trade partner's output; fall in production, consequently waning the country's GDP; translates to low demand for inputs of production including oil which will lead to a decline in Nigeria's export, export revenue and consequently national income.

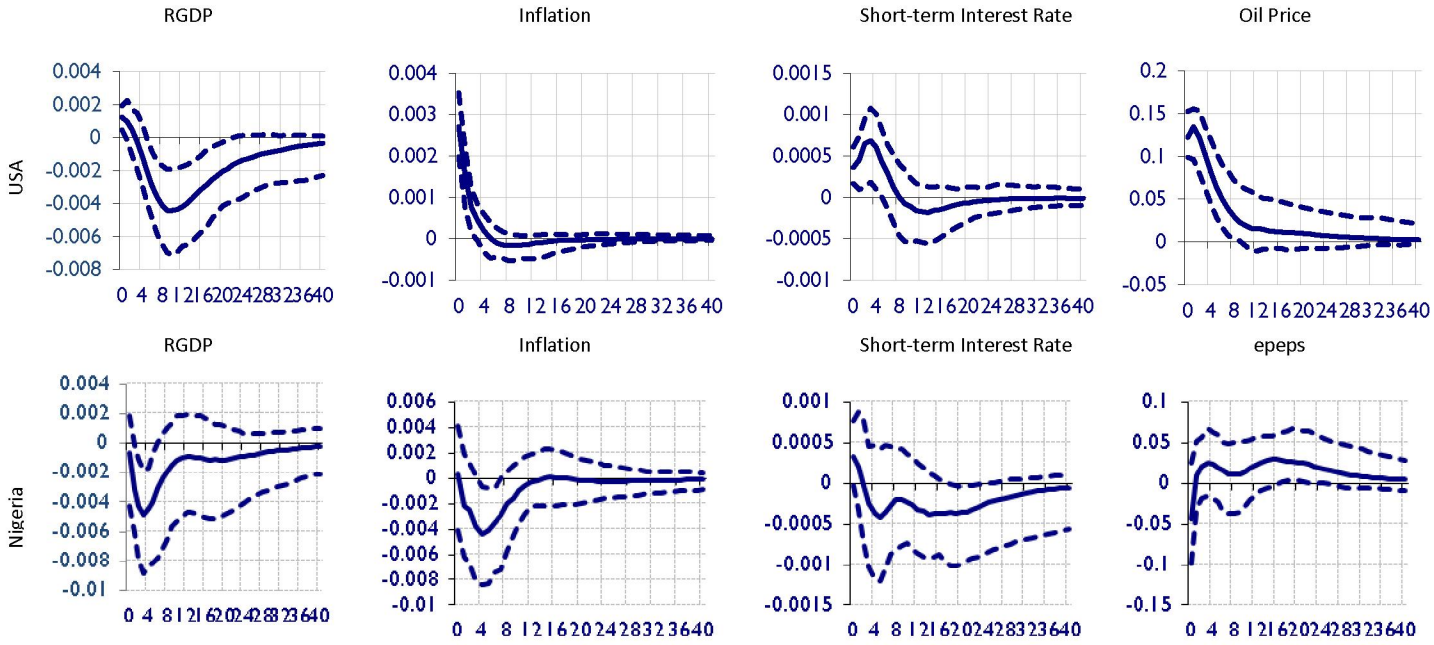
[12] See Dees et al. (2007)

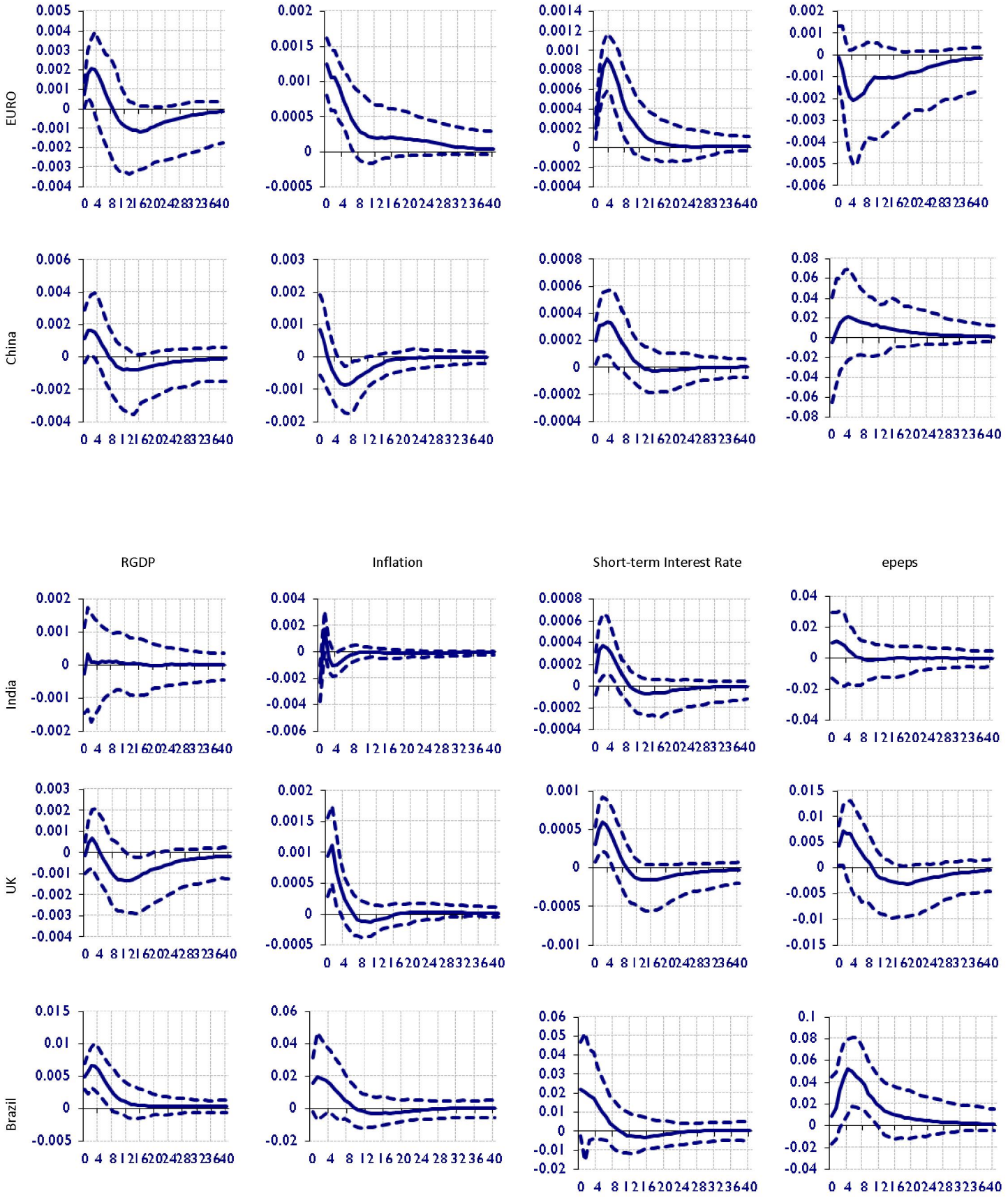
- A one standard error positive shock to Nigeria's major importers' inflation, China, Euro, India, United Kingdom and the United States. These countries are chosen as most of Nigeria's imports come from them, which means it can import their respective inflation.
- A one standard error positive shock to United States short-term interest rate.
- A one standard error positive shock to oil price.

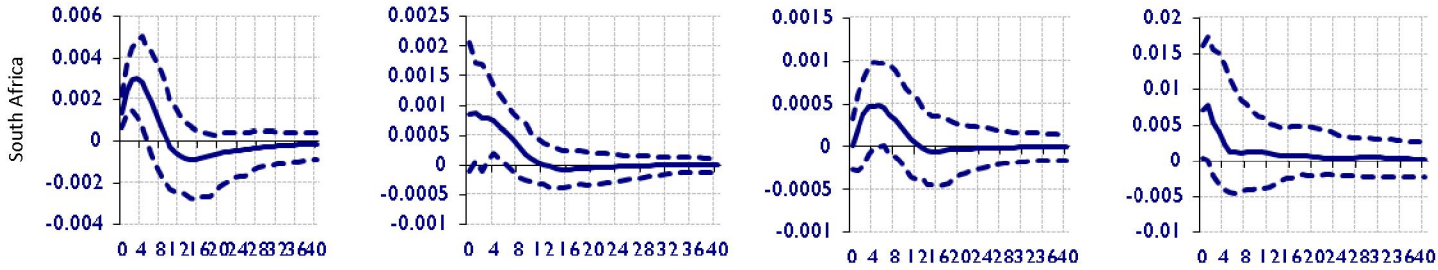
4.7.1 Oil Price Shock

Figure 3 below captures the behviour of Nigeria's macroeconomic variables employed in the study, which proxy the economy, to a one standard error positive shock to oil price. It also displays the time profiles, when the variables start to approach and eventually return to equilibrium. The graphs of the shocks to the rest of the countries and region are also presented here.

Figure 3: One Standard Error Positive Shock to Oil Price




RGDP
Inflation
Short-term Interest Rate
epeps
EURO
China
India
UK
Brazil



The charts presented in figure 3 above display a one standard positive error shock to the price of oil on all the economies included in the model[13]. A shock on impact leads to a rise in oil price up until the second quarter after which it continually falls until it converges to equilibrium. On impact, the shock on oil price has negative effects on the real output of Nigeria. This is consistent with Gordon(1984), and a number of studies conducted on Nigeria which show that positive oil price shocks have negative impact on the country's real output[14]. The shock on impact causes the real output to fall continually until the 4th quarter after which it begins to converge. The effect of the shock on inflation, though statistically insignificant, and short-term interest rate is also negative. Inflation falls until the 4th quater while the short-term interest rate drops until the 6th quater before they start to converge. On the otherhand, the real effective exchange rate rises on average beyond the 2-year period of study.

The fall in real output as a result of a positive oil price shock stems from the uncertainty oil price shocks create which undermines and distabilises effective government fiscal management and operations; thereby negatively affecting economic plans and real output (Ibrahim et al, 2014). Also as reported by Riman et al (2013), the shock causes appreciation of the real effective exchange rate while inducing deindustrialisation. Furthermore, return of oil price to its previous level could lead to the abandoning or halting of projects undertaken during the shock consequently leading to stagnation in econonic activities, as well as the monetization of budget deficit and inflation. Although a number of studies conducted on Nigeria show a positive relationship between positive oil price shocks real out put of Nigeia, this could

[13] The graph of Oil Price is inserted in the Real Effective Exchange Rate (epeps) spot of the US, as the epeps is not included in the US model

[14] Such studies include Omolola (2006) and Ibrahim et al (2014)

be due to their definition of oil price shocks and model specification (Ibrahim, 2014; and Cashin et al, 2012 and 2012)[15].

The appreciation in the real effective exchange rate could have given rise to wealth effects that appreciate the real exchange rate and squeez the tradeable sector of the country, a term known as the Dutch-disease Syndrome[16] (see Akpan. 2010). With oil being the largest export commodity and foreign exchange earner for the country, positive oil price shock (rise), means a decline in the competitiveness of the Nigerian economy as the real effective exchange rate rises. The Dutch-Disease Syndrome along with the excessive monetization of oil receipt and high taste for foreign-made products further explain the fall in domestic real output. Additionally, the negative impact of oil price shocks on inflation of the country further worsen the real output as explained by Fasanya and Onakoya (2013). Just as exposed in other studies[17] on Nigeria, positive oil price shocks affect inflation negatively as presented here. Rather, the excessive monetization of oil receipts and the action of the apex bank of the country induce rise in inflation in Nigeria. Furthermore, the "Spending Effects" of Corden (1984), could also be use to explain rise in inflation after an oil price shock in the country. This posit that with the shock, profit and wages in the oil and other related sectors rise which would lead to increase in the aggregate effective purchasing power and demand consequently in the economy (See, Akpan, 2010). The Short-term interest rate as expected decline with the immediate monetization of the proceeds from oil sale. The monetization leads to increase in the money supply, hence, creating a pressure on the interest rate that drives it down.

A positive oil price shock as expected leads to fall in real output on average of the economies included with the response period and magnitude differing. On impact the real output of the US falls until the 8th quarter (2 years). Oil is a major source of energy and production input for the US and as such, a surge in its price affect the real output negatively. For economies that were net oil exporter, such as the UK and Brazil, or depends on other source of energy (for example coal), such as China and South

[15] Ibrahim et al postulated that once the impact of price on additional resources provided through exports is taken into consideration, the effect of rise in oil price is negative. Aliyu, (2009) for instance reports the effect of oil price as its shocks. Oil price on itself has poistive relationship with the real output but the shock creates uncertainty , hence, causing real output to fall. Cashin et al imposed sign-restrictions

[16] See the response of epeps (appreciation) and the response of rgdp (contraction) in the Nigerian graphs as a result of positive oil price shocks

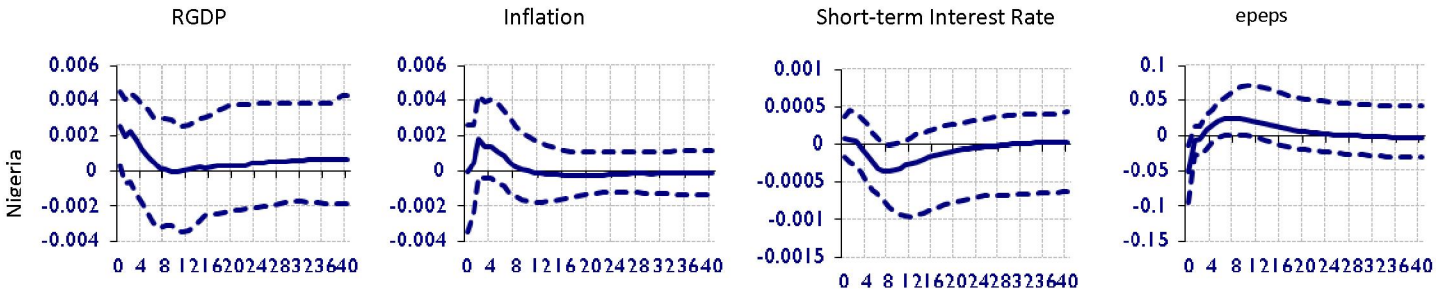
[17] Omolola (2006), Akpan (2010), Adeniyi (2011), and Fasanya and Onakoya (2013)

Africa, the effect is a rise in real output until the 3rd quarter before eventually falling (see Cashin et al, 2012).

4.7.2 Other Shocks

Figures 4 to 16 below depict the graphs of shocks from all of Nigeria's trade partners included in the model to Nigeria[18]. For all the countries and region, a one standard negative error shock to their real ouput on Nigeria's real output is investigated and displayed. The reaction from the real output of Nigeria is stastistically significant for all economies. To capture the effect of inflation, a one standard error positive shock to Nigeria's major import partners in the model is examined, since tranmission of inflation via trade is through importing it from the trade partner. These economies are the United States, Euro, India, China and the United Kingdom. Here also, the response of Nigeria's inflation to her major partners' is statistically significant atleast till the 3rd quarter with the exception of shocks from the UK which is statistically insignificant. With regards to short-term interest rate, only a one standard positive error shock of the United States interest rate is considered given the dominance of the United States in the world. The results reveal that the response of the short term interest rate of Nigeria is statistically significant till the 3rd quarter. The directions of the shocks (positive or negative) are selected based on the theorical premise of the impacts of a positive oil price shocks on the respective economies.

Figure 4: A One Standard Negative Error Shock to US Real Output



[18] Note that the interpretations focus on Nigeria

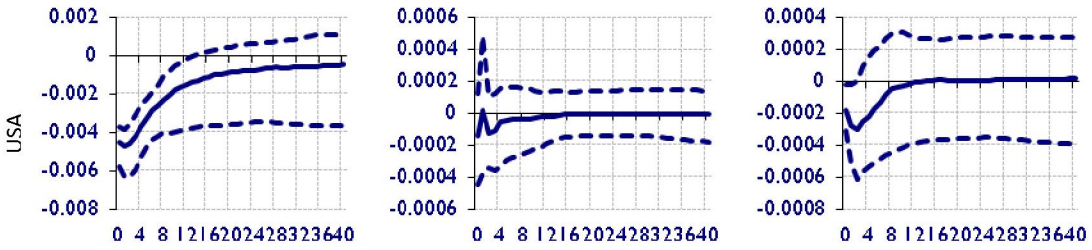


Figure 5: A One Standard Positive Error Shock to US Inflation

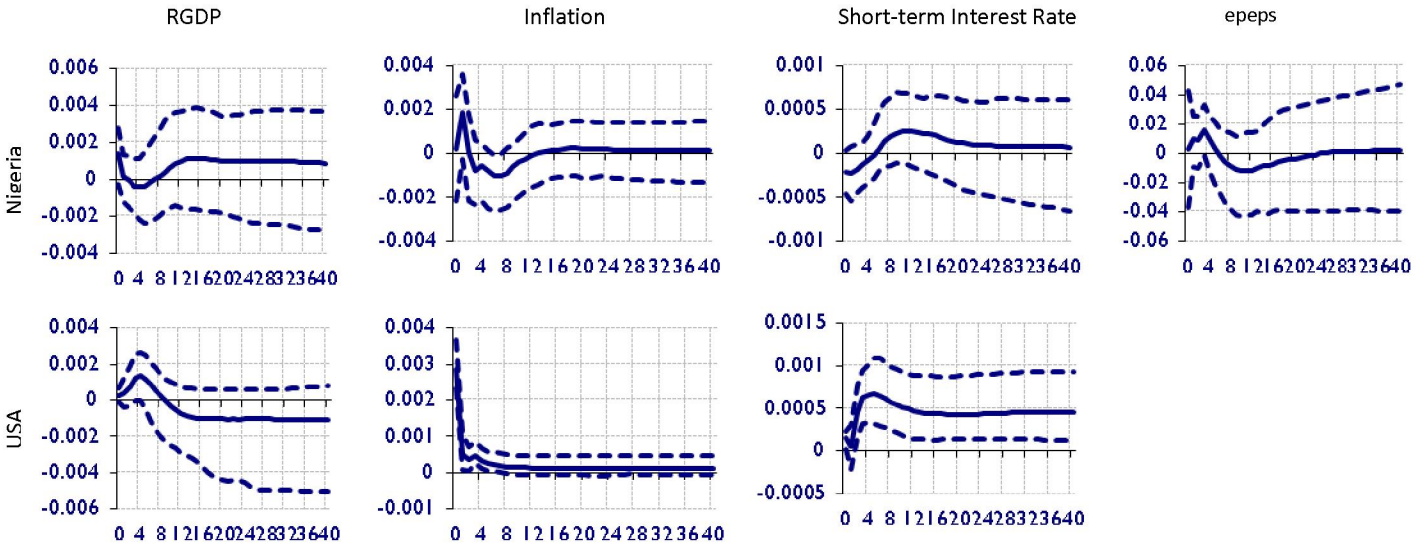


Figure 6: A One Standard Positive Error Shock to US Short-term Interest Rate

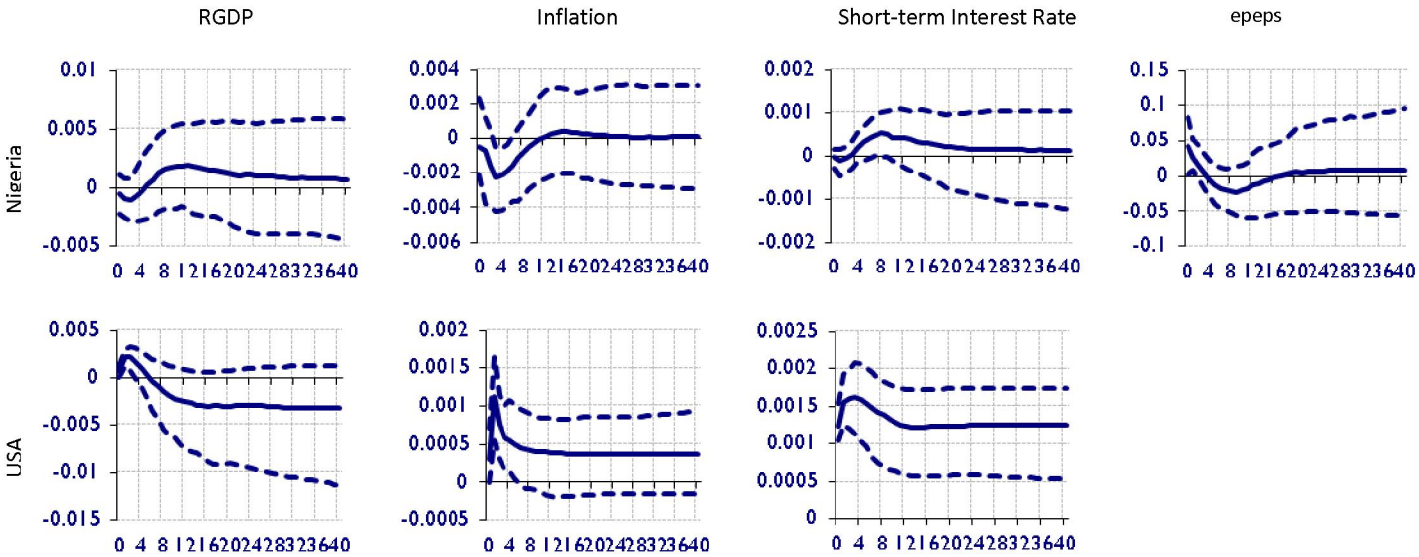


Figure 7: A One Standard Negative Error Shock to Euro Real Output

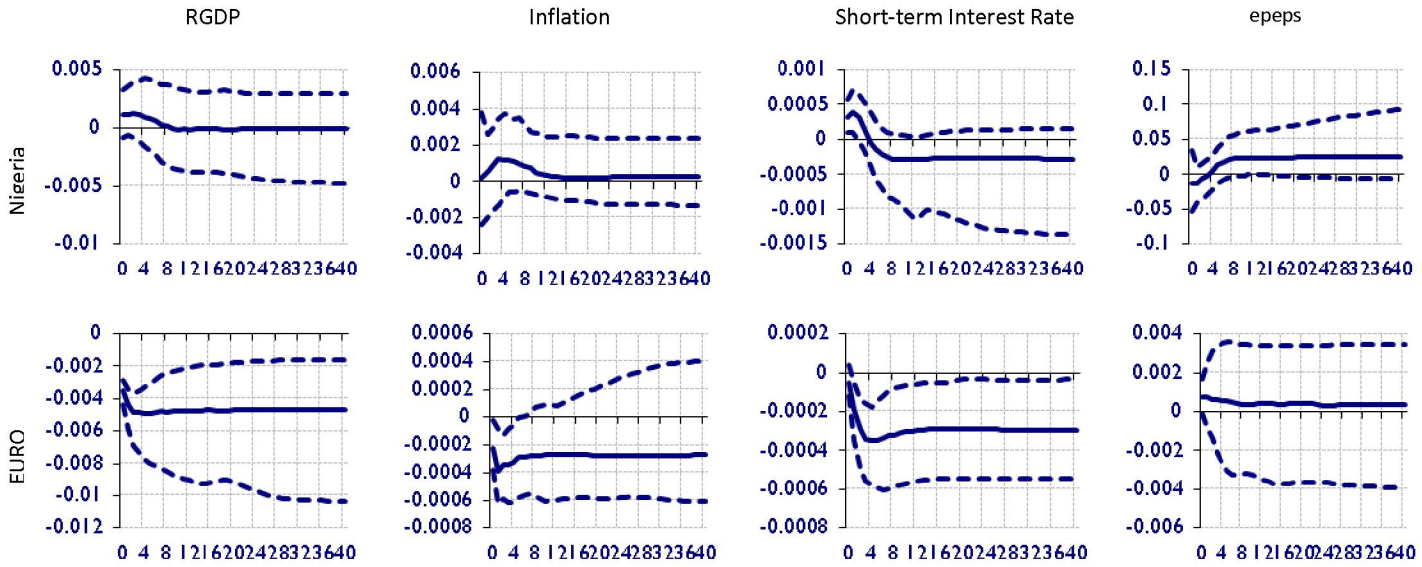


Figure 8: One Standard Positive Error Shock to Euro Inflation

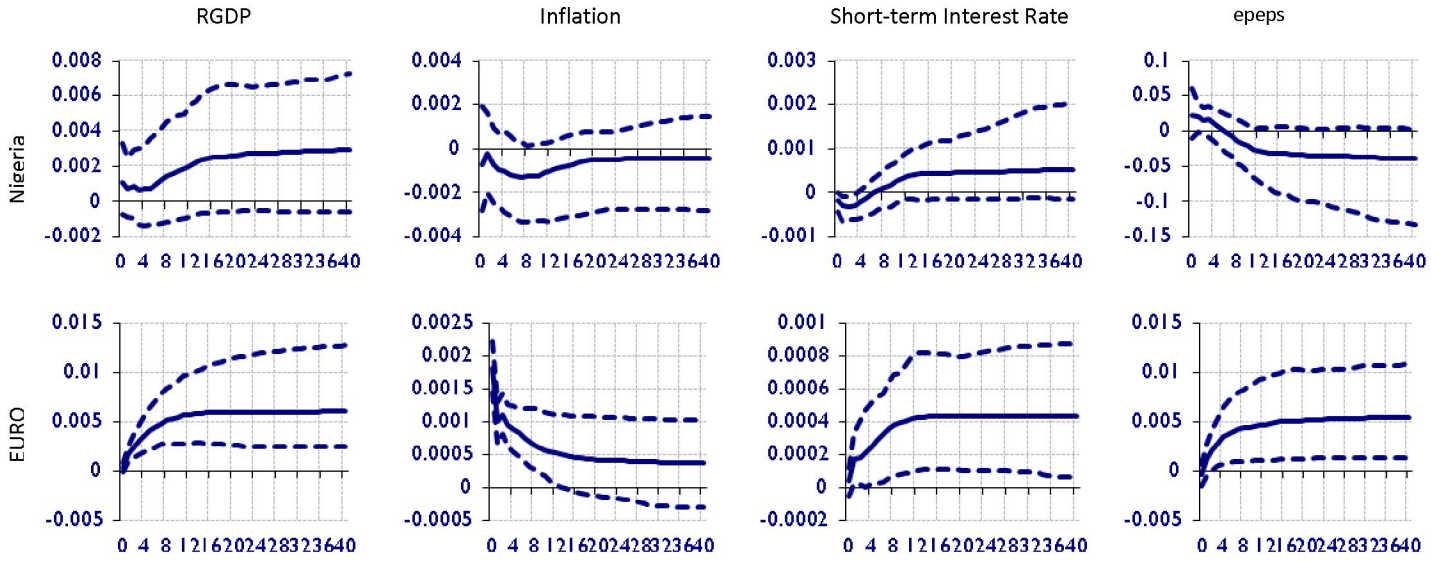
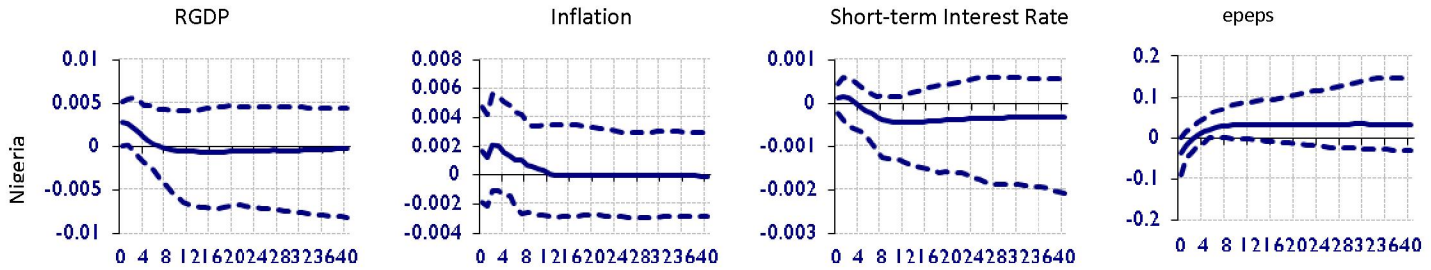


Figure 9: A One Standard Negative Error Shock to China Real Output



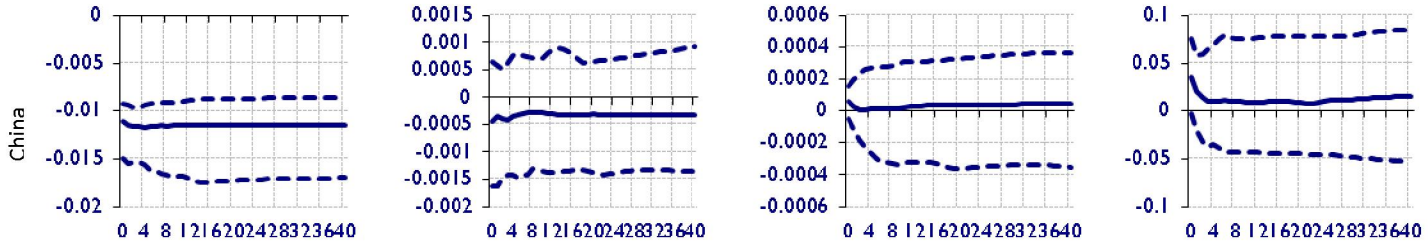


Figure 10: A One Standard Positive Error Shock to China Inflation

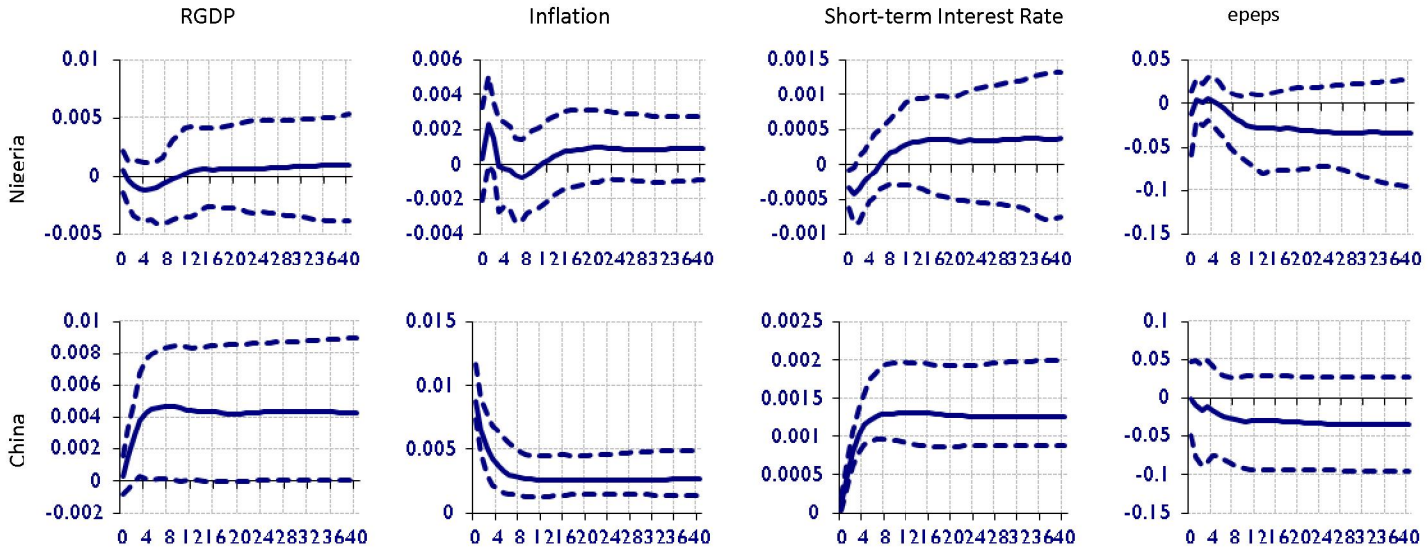


Figure 11: A One Standard Negative Error Shock to India Real Output

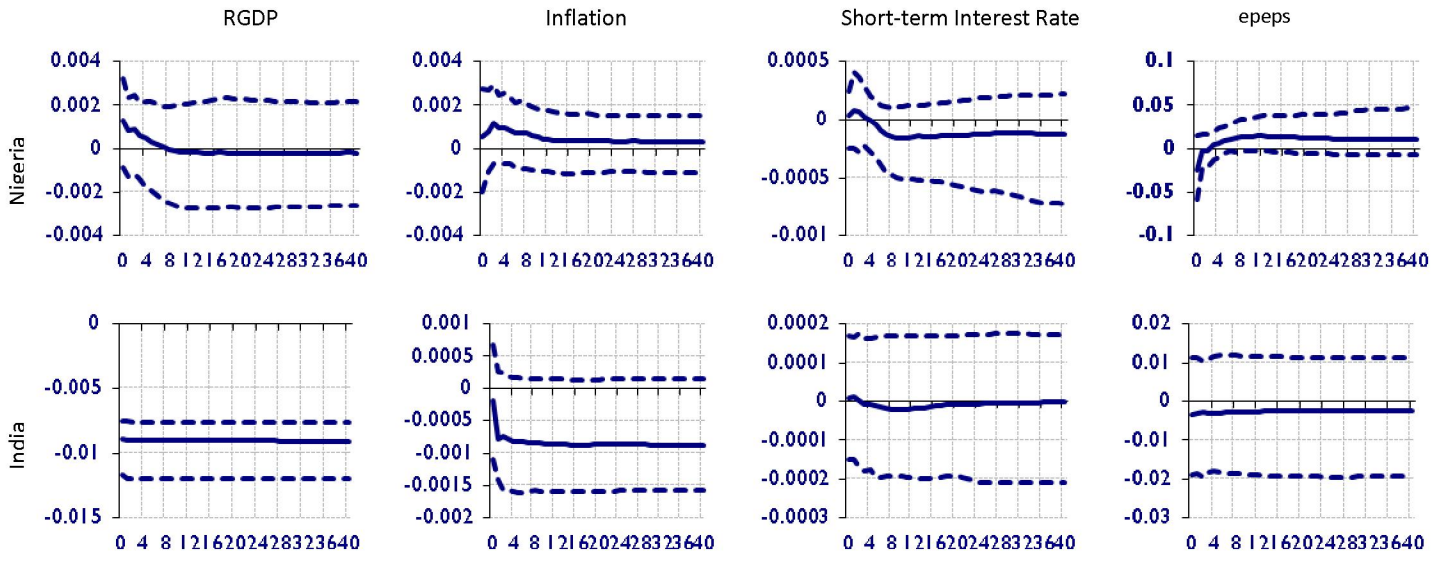


Figure 12: A One Standard positive Error Shock to India Inflation

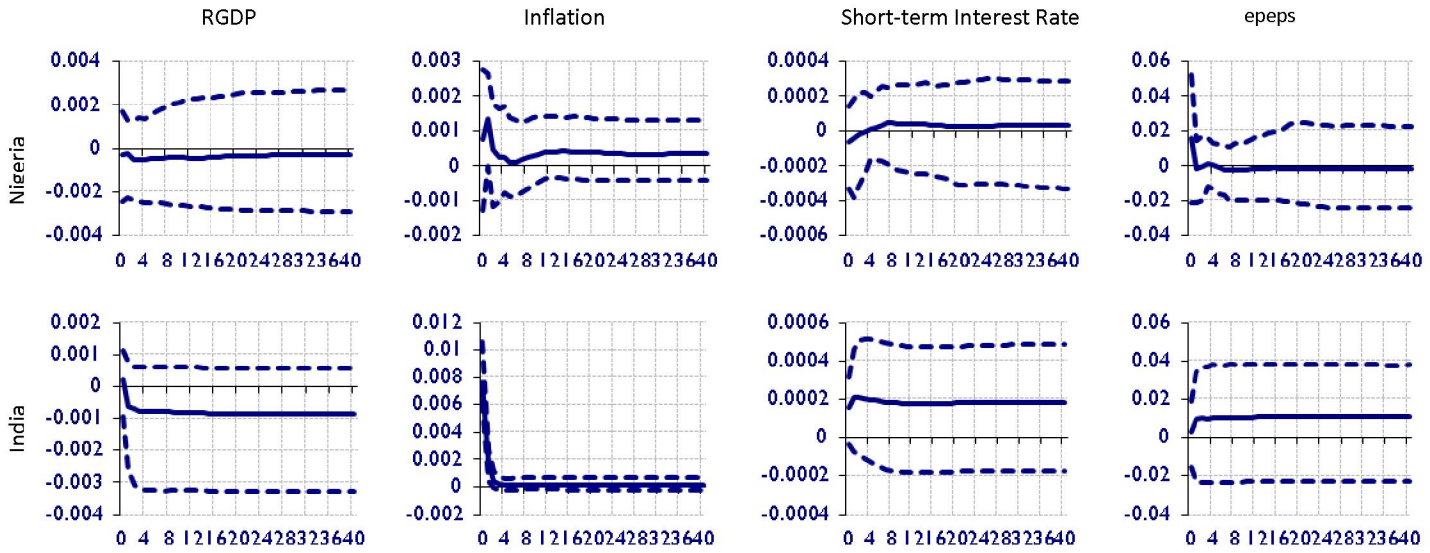


Figure 13: A One Standard Negative Error Shock to UK Real Output

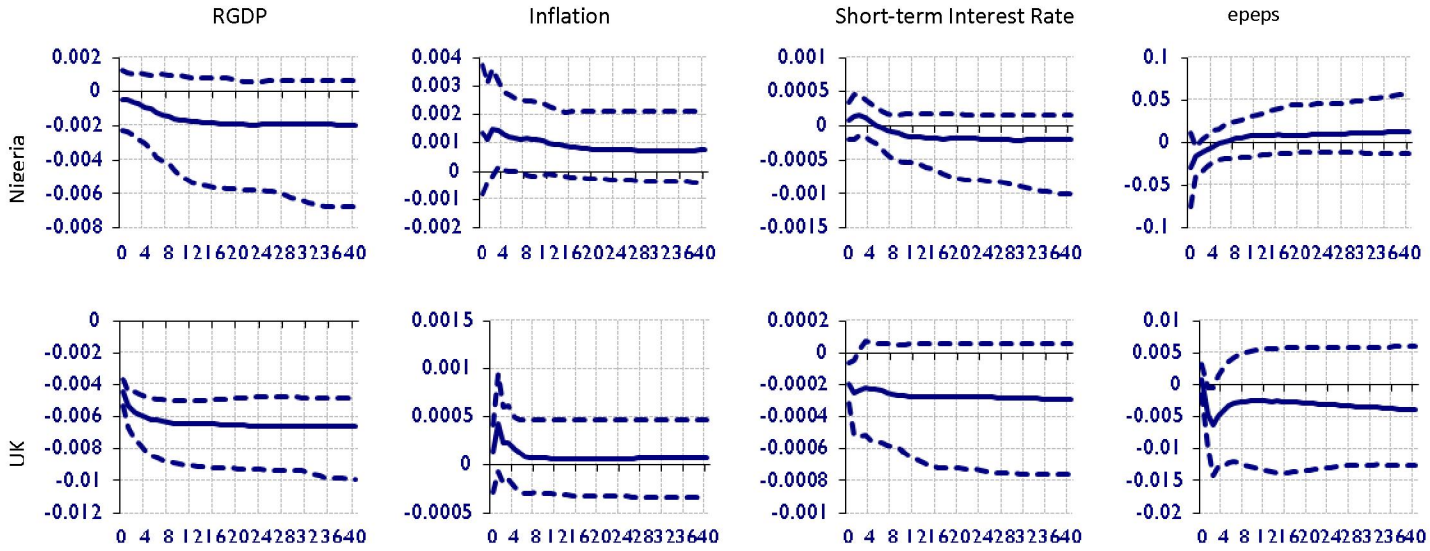
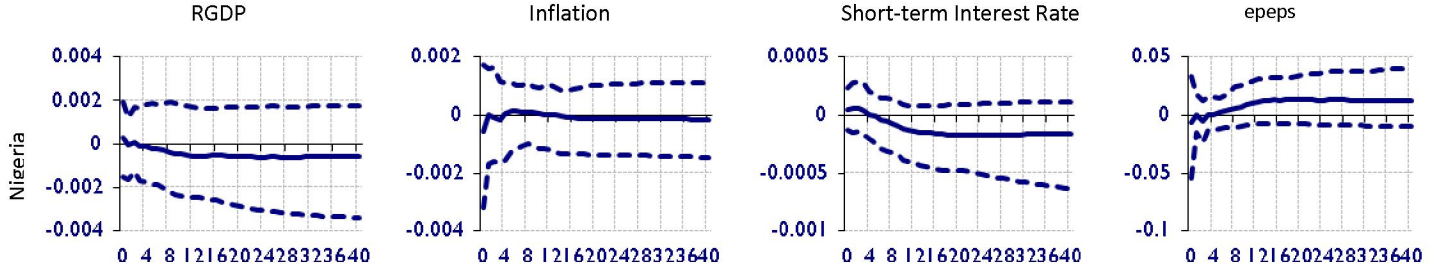


Figure 14: A One Standard Positive Error Shock to UK Inflation



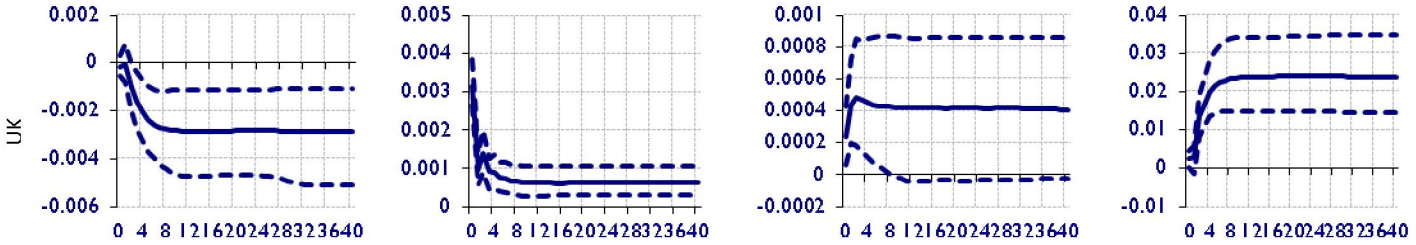


Figure 15: A one standard negative error shock to Brazil Real Output

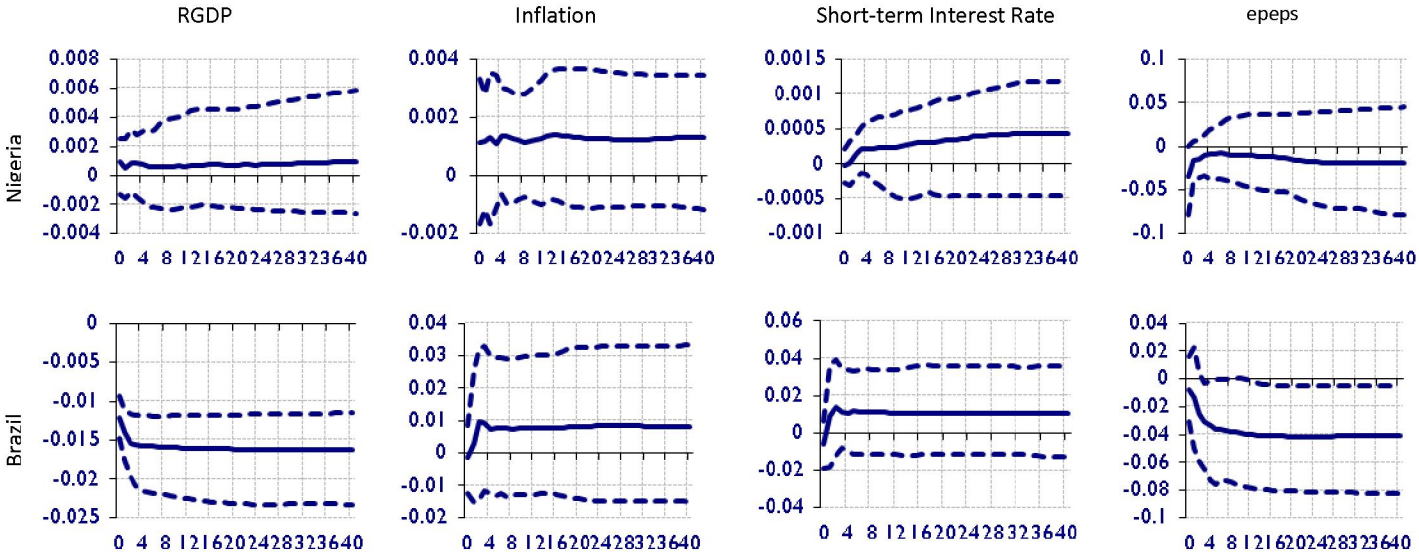
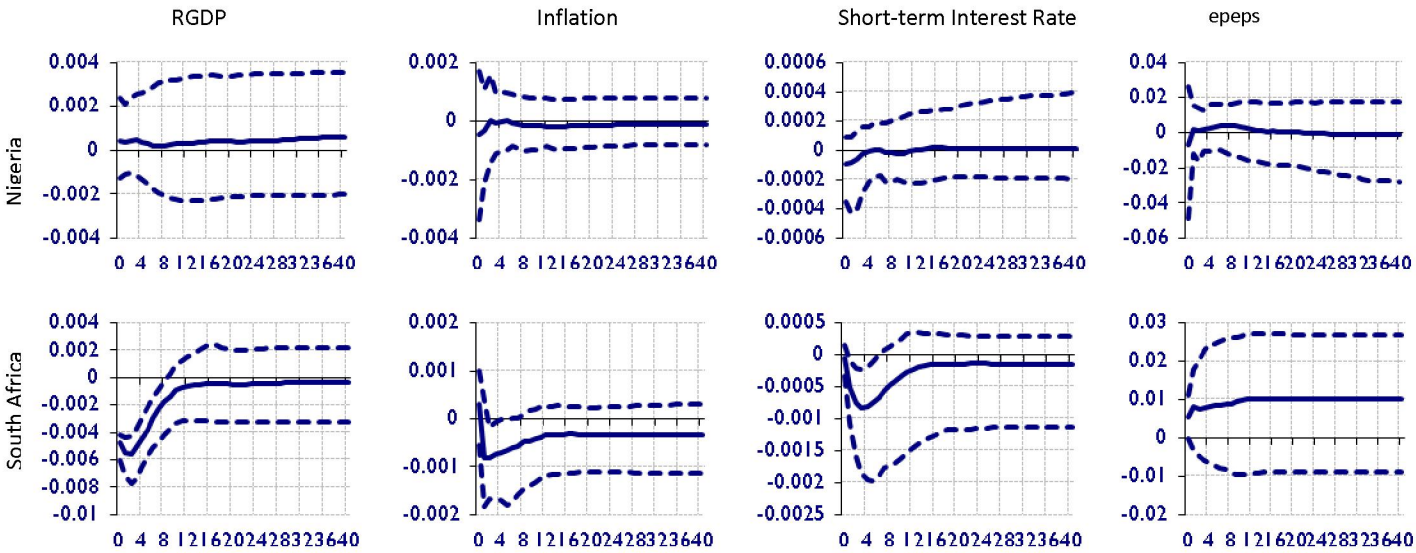


Figure 16: A One Standard Error Shock to South Africa Real Output



From the graphs in the figures above, the results of a one standard error negative shock to the respective economies' real outputs reveal that the reaction of the real output and inflation of Nigeria varies in magintude and persistence but not in direction. The shocks induce a fall in Niegeria's real output and a rise in inflation. Although, inflation is statistiscally insignificant for US and Euro. On impact, the real output of Nigeria, with regards to the negative shock from the real output of the afformentioned economies, drops with the speed of adjustment and time differing between countries and region. This is very interestig as it depicts that a fall or slow down of global economic growth, represented by the countries and region included in the model, which theoritically adversely affects the demand for commodities[19] including oil, causes economic downturn in Nigeria. This is further worsen as oil is the major foreign exchange earner for the country and it depends on import for most if not all capital as well as consumer products it uses. This explains the foreign exchange crisis and recession the country has plunged into since the later part 2016.

On impact, the negative shock to US real output leads to a fall in the US real output till the 2nd quarter. In the case of Nigeria, the impact is a continuous fall in real output that lasts beyond the study period of 2 years. This is no surprise as the US is the largest trade partner of the country and accounts for 33% of the trade with Nigeria as evident in the trade weight. This is consistent with Cashin et al (2012). As expected, the negative shock to US real output leads to a fall in the real output of all the economies included except India which is impacted negatively in the medium to longrun.

With regards to individual economy's real output response to a negative shock in its real output, the reponses exhibit similar trends on impact. The real outputs of the economies fall. Indian output shows the least reponse to a one standard negative shock to its output. For most of economies including the US, the shock impacts last for only 2 quarters. The response of the Nigeria's real output to negative innovations in her trade partners features a positive direction, which implies that if such innovations lead to a fall in the economies real output, it leads to a fall in Nigeria's real ouput and rise in the country's inflation.

[19] See Larusso and Pieroni (2015), where they show that major oil price movements since the mid 1970s have come from demand side

The effects of a negative shocks of the economies' real output on Nigeria's short-term interest rate is a fall in the interest rate on average except for Brazil's where the interest rate rises and is statistically insignificant on impact. It is also insignificant for India and the UK. This depicts how susceptible the monetary policies of Nigeria are to the fluctuations in economic performance of her trade partners. The US, Euro and South Africa's real outputs have the biggest influnence on the country's short term interest rate. Inflation rises in response to the negative innovations in real ouput of the respective economies. This is because Nigeria is an import economy that imports virtually all that it uses including refined petroleum products. The imports come from these economies and the economies with smaller portion of import over the period of study exhibit marginal effect on the country's inflaton. Since these economies are manufacturing economies that need oil in production process, a fall in their respective real output leads to decline in production and eventually income resulting in deciline in the competitiveness of Nigeria, a net oil exporter, thereby, culminating in rise in the country's real effective exchange rate as depicted in the figures above.

With the exception of India, a one standard positive shock to inflation of the economies leads to fall in Nigeria's real output. The inflation of Nigeria rises on impact until the 2nd quarter after a positive shock to the inflation of the economies included in the model except for South Africa where the inflation level drops. The magintude depends on the originating economy with the United States having the highest impact an suspected. In response to inflation shock from all the economies, the domestic short-term interest rate of Nigeria rises on average, though statistically significant for shocks from India and the UK.

The effects of a one standard positive error shock to Nigeria's trade partners' inflation on Nigeria presented above reveal that inflation in Nigeria if not domestically orginated by the activities of the major economic players in the country such as the central bank and the government, may be imported but not caused by positive oil price shocks.

With regards to a standard positive error shock to the United States shor-term interest, short-term interest rate in Nigeria gradually rises on average until the 8th quarter (2 years) when it peaks with a magnitude of 0.001 and gradually dies

afterwards. On impact, real output of Nigeria drops quickly rising in the 3rd quarter and peaks at the 12th quarter with median estimate of 0.002. Inflation and Real effective exchange rate decline reaching minimum of -0.002 and -0.022 at the 4th and 8th quarters respectively before dieing out. Although the response of short term interest rate is statistically insignificant. This reveals that, even though, the economy's financial linkage to the world has been little. It also shows the monetary policy interlinkages between the country and the US.

CHAPTER IV

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it could be concluded that the Nigerian economy is volatite to oil price shocks, directly through rise in the price of the product in the world market and indirectly through trade linkages with its major trade partners. The findings reveal that oil price shocks cause macroeconomic instability in Nigeria, thereby posing a great threat or destabilizating economic management and planning in the country. Despite the traditional belief that positive oil price shock (rise in oil price), would lead to increase in real output of a net-oil exporting economy, the study reveals that it actually leads to fall in real output of Nigeria. The study further reveals that with fall in the real output of the trade partners of Nigeria, the real output of Nigeria falls even as inflation rise. As such, any growth in output even when it coincides with a positive oil price shocks is mere coincidence. It could have come from a rise in global growth or originated domestically such as the growth of the telecommunication sector and the film industry.

In a similar vein, a positive oil price shock in the world oil market leads to a fall in domestic inflation in Nigeria while a rise in the country's trade partner's inflation leads to a rise in the country's domestic inflation. However, the rise in the inflation lasts between 2 to 3 quarters. This suggest that fiscal poilcy, the monetization of oil receipt and the monetary policies adopted and implemented by the country's apex bank after a positive oil price shock cause or prolong inflation. Although, inflation is imported by the country, it last for 2 to 3 quarters before it starts dieing out, and when prolong, it is augmented by domestic activities of the major domestic economic players in the economy.

With regard to real effective exchange rate, it rises, which shows the decline in the competitivenes of the Nigerian economy and the appearance of the Dutch-Disease Syndrome, as oil price surge. Short-term interest rate falls as oil price surge. This could be attributed to the excessive monetization of oil receipt which leads to rise in money suppy, savings and cosequently fall in interest rate. The short-term interest rate shows a positive relationship with the short-term interest rate of the United States, the dominant economy, which reveals the financial linkage between the country and the world.

In a nut shell, the findings paint an erratic future for Nigeria, a small open economy that depends largely on oil for foreign exchange and imports the raw and intermediary goods it uses in production, after an oil price shock that affects the economy through the first-round effects as well as the spill-over effects. Since, Nigeria does not affect or influence the macroeconomic variables of the trading partners; on the whole, the policy markers need to focus on the policies that will cushion not only the first-round effects but also the spill-over effects. The macroeconomic structure needs to be strenghten through diversification of the economy, fiscal dicipline, credible monetary policies, alternative source of earning foreign exchange and saving the proceeds of oil during boom so as to be able to cushion any bust in the future such as the persistent fall of the global price of oil due to increase in oil production in the United States since late 2014 and the slow down of global economic growth.

Further research in this area is advised by expanding the model through the adoption of other macroecomic variables such as money supply, industrial output, government revenue and expenditure; as well as increasing the number of economies in the modelling. Also if sign restrictions are imposed the real GDP of Nigeria can share positive relationship with positive oil price shock. Also, the magnitude of response of Nigeria's real output to a negative shock to Euro's output can be larger (see Cashin et al, 2012).

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APPENDIX

Table A

Unit Root Tests for the Global Variables at the 5% Significance Level

Global Variables	Test	Critical Value	Statistic
poil (with trend)	ADF	-3.45	-1.52595
poil (with trend)	WS	-3.24	-1.14175
poil (no trend)	ADF	-2.89	-0.18662
poil (no trend)	WS	-2.55	-0.63835
Dpoil	ADF	-2.89	-6.76753
Dpoil	WS	-2.55	-6.93842
DDpoil	ADF	-2.89	-9.55897
Dpoil	WS	-2.55	-9.72141

Table: B

Unit Root Tests for the Domestic Variables at the 5% Significance Level

Domestic Variables	Statistic	Critical Value	BRAZIL	CHINA	EURO	INDIA	NIGERIA	SOUTH AFRICA	UNITED KINGDOM	USA
y (with trend)	ADF	-3.45	-2.33066	-2.22104	-0.3861	-1.23839	-2.69017	-1.45611	-2.1642	-1.2658
y (with trend)	WS	-3.24	-2.30532	-2.28559	-0.81924	-1.24905	-2.48361	-1.58924	-2.17731	-1.60402
y (no trend)	ADF	-2.89	1.049939	0.444432	-1.57254	1.830966	-0.02913	0.991838	-1.27236	-1.17503
y (no trend)	WS	-2.55	1.669339	0.268837	0.85684	1.128442	0.053833	1.198523	-0.55025	0.852047
Dy	ADF	-2.89	-6.91117	-3.61992	-4.18119	-8.07569	-3.7525	-5.09602	-4.61048	-4.9052
Dy	WS	-2.55	-6.57234	-3.79347	-4.37909	-8.19848	-3.89073	-5.1235	-3.51183	-4.68733
DDy	ADF	-2.89	-9.12771	-11.6739	-8.90909	-8.8042	-17.5243	-8.45835	-7.4745	-8.33504
DDy	WS	-2.55	-8.19578	-11.7362	-8.93022	-8.95125	-17.7732	-8.23125	-7.58919	-8.04687
Dp (with trend)	ADF	-3.45	-2.83197	-3.12716	-3.04645	-6.08452	-4.57564	-4.53219	-5.40304	-4.51026
Dp (with trend)	WS	-3.24	-2.83255	-3.15569	-1.94067	-6.19976	-4.64871	-4.57548	-2.23661	-1.37491
Dp (no trend)	ADF	-2.89	-2.24824	-2.95821	-3.34362	-5.99773	-4.42707	-2.78019	-5.31991	-4.65106
Dp (no trend)	WS	-2.55	-2.50701	-3.11228	-0.58788	-6.05061	-4.55807	-2.85524	-1.03829	-0.04639
DDp	ADF	-2.89	-6.42892	-7.19162	-7.03781	-9.43118	-7.99537	-8.65868	-8.40505	-9.94486
DDp	WS	-2.55	-6.63294	-7.39891	-7.14436	-9.68705	-8.1539	-8.84568	-8.57352	-10.1628
DDDp	ADF	-2.89	-9.10672	-9.21224	-10.1455	-10.6719	-11.6656	-10.4466	-9.57008	-12.1217
DDDp	WS	-2.55	-9.34146	-9.45391	-9.98749	-10.8154	-10.7372	-9.61645	-8.29753	-11.9104
r (with trend)	ADF	-3.45	-3.10885	-1.89056	-3.35796	-3.60888	-2.09649	-3.75231	-3.42874	-3.83176
r (with trend)	WS	-3.24	-2.92308	-1.72117	-3.23625	-3.67271	-1.68013	-2.84168	-3.61767	-3.95187
r (no trend)	ADF	-2.89	-2.53919	-1.20343	-1.22794	-3.34095	-2.25398	-2.869	-1.59632	-2.28629
r (no trend)	WS	-2.55	-2.71115	-1.58909	-1.22525	-3.52876	-1.65048	-2.63735	-1.17691	-1.58635
Dr	ADF	-2.89	-9.46789	-6.25957	-5.2685	-6.45857	-7.75779	-6.15067	-7.40023	-3.81632
Dr	WS	-2.55	-9.66656	-6.40959	-4.34852	-6.60857	-7.96744	-6.23384	-6.96658	-3.93605
DDr	ADF	-2.89	-11.6905	-8.08481	-8.91283	-9.86465	-9.08091	-8.40643	-9.54098	-6.39241
DDr	WS	-2.55	-11.9647	-8.30753	-8.6686	-10.0689	-9.29127	-8.6014	-9.25214	-7.68406
epeps (with trend)	ADF	-3.45	-2.20065	-1.51225	-3.21725	-2.22872	-1.84435	-3.69196	-2.91558	
epeps (with trend)	WS	-3.24	-1.83865	-2.716	-2.91264	-2.08096	-2.05901	-3.90033	-3.09456	
epeps (no trend)	ADF	-2.89	-2.04304	-2.95642	-3.27535	-0.56588	-1.70195	-2.2085	-2.74567	
epeps (no trend)	WS	-2.55	-0.73756	-2.72721	-2.7754	-0.71161	-1.47746	-2.05438	-2.77165	
Depeps	ADF	-2.89	-9.0397	-9.48433	-5.96944	-8.31086	-7.65775	-5.74716	-6.19387	
Depeps	WS	-2.55	-1.4859	-2.00703	-6.13924	-8.46067	-7.14303	-5.92899	-4.81234	
DDepeps	ADF	-2.89	-12.5392	-16.521	-9.11407	-8.67856	-9.61319	-16.1161	-8.34086	
DDepeps	WS	-2.55	-6.11758	-4.20525	-9.20358	-8.90744	-10.0758	-16.3269	-8.55923	

Table: C

Unit Root Tests for the Foreign Variables at the 5% Significance Level

Foreign Variables	Statistic	Critical Value	BRAZIL	CHINA	EURO	INDIA	NIGERIA	SOUTH AFRICA	UNITED KINGDOM	USA
ys (with trend)	ADF	-3.45	-4.13869	-1.41357	-4.04024	-4.35939	-2.65657	-3.55072	-1.2211	-3.04706
ys (with trend)	WS	-3.24	-3.73762	-1.66323	-3.47029	-3.70398	-2.64607	-2.90235	-1.48732	-2.55439
ys (no trend)	ADF	-2.89	-0.23273	-0.98513	0.028541	-0.12365	-0.51658	-0.2401	-1.11074	0.41182
ys (no trend)	WS	-2.55	1.173527	1.178957	0.544078	1.231185	1.204994	1.07179	1.158478	0.735408
Dys	ADF	-2.89	-4.34085	-4.89755	-4.34598	-4.55395	-4.72091	-4.09672	-4.40079	-4.00634
Dys	WS	-2.55	-4.37951	-4.95731	-4.07966	-4.6774	-4.84365	-4.14655	-4.56155	-4.18186
DDys	ADF	-2.89	-10.7359	-7.70276	-9.98058	-10.249	-9.05084	-10.1107	-9.21831	-10.4842
DDys	WS	-2.55	-10.561	-7.77537	-9.78256	-9.99072	-8.53186	-9.96907	-9.03096	-10.4009
Dps (with trend)	ADF	-3.45	-3.26212	-2.88426	-2.3578	-2.47413	-2.83556	-2.58798	-2.99184	-2.63145
Dps (with trend)	WS	-3.24	-3.42575	-3.04884	-2.56439	-2.59017	-2.94904	-2.75528	-3.04858	-2.61995
Dps (no trend)	ADF	-2.89	-2.69397	-1.88091	-1.92344	-1.8082	-1.81022	-1.92719	-2.07038	-2.012
Dps (no trend)	WS	-2.55	-2.46498	-1.97941	-2.11093	-2.04579	-2.02759	-2.09588	-1.16186	-2.27975
DDps	ADF	-2.89	-7.2796	-9.21462	-8.52426	-10.1414	-9.31758	-10.0479	-7.54223	-9.81159
DDps	WS	-2.55	-7.48437	-9.37538	-8.52107	-10.3055	-9.4925	-10.2063	-7.74027	-9.97159
DDDps	ADF	-2.89	-9.59285	-9.75179	-10.3075	-9.18801	-9.79511	-9.63989	-10.2971	-9.38785
DDDps	WS	-2.55	-9.9322	-9.72275	-9.86452	-9.46233	-9.82423	-9.91711	-10.3842	-9.58603
rs (with trend)	ADF	-3.45	-3.09659	-3.12098	-2.92839	-2.84336	-3.07499	-2.74414	-2.86761	-2.82966
rs (with trend)	WS	-3.24	-2.93755	-2.82626	-2.66529	-2.39307	-2.79366	-2.28195	-2.10068	-2.50665
rs (no trend)	ADF	-2.89	-1.1629	-1.95546	-1.81134	-1.51685	-2.06551	-1.27443	-0.76	-1.87246
rs (no trend)	WS	-2.55	-1.21974	-2.22071	-2.09172	-1.82838	-2.31457	-1.61479	-1.11884	-2.13428
Drs	ADF	-2.89	-4.97181	-9.42913	-9.24597	-10.9333	-9.43168	-10.8859	-10.1164	-9.19912
Drs	WS	-2.55	-4.8441	-9.60797	-9.42108	-11.0917	-9.61946	-11.0292	-10.1764	-9.38712
DDrs	ADF	-2.89	-8.40042	-11.7199	-11.4027	-11.3043	-11.669	-11.1727	-10.9828	-11.3713
DDrs	WS	-2.55	-8.05905	-11.9925	-11.668	-11.5674	-11.9426	-11.4254	-11.1828	-11.6405
epepss (with trend)	ADF	-3.45	-1.68788	-2.21573	-2.16784	-1.56136	-2.04532	-1.9143	-2.23935	-1.75584
epepss (with trend)	WS	-3.24	-2.74813	-2.4816	-2.91108	-2.70139	-2.53553	-2.76966	-2.96741	-2.81001
epepss (no trend)	ADF	-2.89	-2.85083	-0.713	-2.60951	-3.26748	-0.4727	-1.73926	-2.30683	-2.91419
epepss (no trend)	WS	-2.55	-2.72537	-0.47562	-2.69804	-2.70097	-0.45754	-2.27067	-2.68062	-2.77923
Depepss	ADF	-2.89	-8.58407	-14.0121	-8.29421	-8.15244	-27.2396	-9.26979	-9.5092	-8.87395
Depepss	WS	-2.55	-2.16962	-3.89106	-1.54941	-1.82973	-3.2043	-2.18899	-3.32216	-1.95298
DDepepss	ADF	-2.89	-15.6861	-9.53516	-14.1188	-15.6525	-12.281	-15.1619	-15.7216	-16.1193
DDepepss	WS	-2.55	-4.13668	-7.96873	-3.98033	-3.82378	-6.55326	-4.55534	-4.96063	-3.99501

Table D

Cointegration Rank Based On Maximum Eigenvalue Statistics And Trace Statistics For The Countries/Region Included In The Model At 5% Significance Level

Detailed Cointegration Results for the Maximum Eigenvalue Statistic at the 5% Significance Level

Country	BRAZIL	CHINA	EURO	INDIA	NIGERIA	SOUTH AFRICA	UNITED KINGDOM	USA
# endogenous variables	4	4	4	4	4	4	4	3
# foreign (star) variables	4	4	4	4	4	4	4	4
r=0	105.7324	94.97334	43.22259	74.69675	52.76513	55.71828	102.3017	81.77915
r=1	83.6917	75.1631	40.59492	20.54627	38.15394	43.34901	30.66248	35.21329
r=2	17.13032	25.98717	24.86998	14.86664	37.05119	19.53218	17.56965	18.57399
r=3	9.773986	17.11113	9.903686	13.84644	11.29958	15.91459	14.11688	

Detailed Cointegration Results for the Trace Statistic at the 5% Significance Level

Country	BRAZIL	CHINA	EURO	INDIA	NIGERIA	SOUTH AFRICA	UNITED KINGDOM	USA
# endogenous variables	4	4	4	4	4	4	4	3
# foreign (star) variables	4	4	4	4	4	4	4	4
r=0	216.3284	213.2347	118.5912	123.9561	139.2698	134.5141	164.6508	135.5664
r=1	110.596	118.2614	75.36858	49.25935	86.50471	78.79578	62.34901	53.78728
r=2	26.9043	43.0983	34.77366	28.71308	48.35077	35.44677	31.68654	18.57399
r=3	9.773986	17.11113	9.903686	13.84644	11.29958	15.91459	14.11688	

Critical Values for Trace Statistic at the 5% Significance Level (MacKinnon, Haug, Michelis, 1999)

Country	BRAZIL	CHINA	EURO	INDIA	NIGERIA	SOUTH AFRICA	UNITED KINGDOM	USA
# endogenous variables	4	4	4	4	4	4	4	3
# foreign (star) variables	4	4	4	4	4	4	4	4
r=0	100.96	100.96	100.96	100.96	100.96	100.96	100.96	71.56
r=1	71.56	71.56	71.56	71.56	71.56	71.56	71.56	45.9
r=2	45.9	45.9	45.9	45.9	45.9	45.9	45.9	23.63
r=3	23.63	23.63	23.63	23.63	23.63	23.63	23.63	

Table: E

Eigenvalues of the GVAR Model

Eigenvalues of the GVAR Model in Descending Order		Corresponding Moduli
1.00000000000000 +0.00000000000000i		1
1.00000000000000 -0.00000000000000i		1
	1	1
	1	1
	1	1
	1	1
	1	1
	1	1
	1	1
	1	1
	1	1
	1	1
	1	1
1.00000000000000 +0.00000000000000i		1
1.00000000000000 -0.00000000000000i		1
	0.950009	0.950009
0.80787866908508 +0.10768923472763i		0.815024
0.80787866908508 -0.10768923472763i		0.815024
0.76342070502961 +0.12204092526297i		0.773114
0.76342070502961 -0.12204092526297i		0.773114
0.72637741712287 +0.08438838648574i		0.731263
0.72637741712287 -0.08438838648574i		0.731263
	0.70035	0.70035
	0.666357	0.666357
0.58686517190674 +0.18409352935668i		0.646801
0.58686517190674 -0.18409352935668i		0.646801
0.57407307789883 +0.07353585091461i		0.615062
0.57407307789883 -0.07353585091461i		0.615062
0.56803485124215 +0.30933409083787i		0.578764
0.56803485124215 -0.30933409083787i		0.578764
	0.424116	0.514007
	0.37836	0.514007
0.36643155271523 +0.11683431661085i		0.424116
0.36643155271523 -0.11683431661085i		0.387243
	0.274172	0.387243
0.25408683189458 +0.20134868799425i		0.384607
0.25408683189458 -0.20134868799425i		0.384607

0.17407846933458 +0.00513849408903i		0.37836
0.17407846933458 -0.00513849408903i		0.345414
0.12991807704621 +0.221121278818l0i		0.345414
0.12991807704621 -0.221121278818l0i		0.342657
0.07551889966943 +0.09299561159395i		0.342657
0.07551889966943 -0.09299561159395i		0.324193
	0.027281	0.324193
	0	0.274172
	0	0.256463
	0	0.256463
-0.00000000000000 +0.00000000000000i		0.203278
-0.00000000000000 -0.00000000000000i		0.174154
	-0.00023	0.174154
	-0.00123	0.122397
-0.00315409972805 +0.51399700173471i		0.119797
-0.00315409972805 -0.51399700173471i		0.119797
	-0.02583	0.0899
	-0.0899	0.027281
-0.11085203325521 +0.32423100738497i		0.025827
-0.11085203325521 -0.32423100738497i		0.001228
	-0.1224	0.000229
	-0.20328	1.68E-15
-0.27626887007409 +0.20733108373433i		1.68E-15
-0.27626887007409 -0.20733108373433i		2.14E-16
-0.38518413626997 +0.03987594414920i		1.33E-16
-0.38518413626997 -0.03987594414920i		1.2E-16

Table F

Structural Stability Tests: Break Dates for QLR Tests

Variables	y	Dp	r	epeps
Brazil	1990Q1	1990Q2	1990Q2	1984Q3
China	1984Q4	1988Q3	1988Q4	1984Q4
Euro	1987Q3	1986Q1	1984Q4	2002Q1
India	1990Q3	1997Q2	1994Q3	2003Q4
Nigeria	1985Q1	1989Q3	1991Q4	1984Q3
South Africa	1986Q2	1984Q3	1985Q1	1986Q3
United Kingdom	1986Q1	1986Q2	1988Q3	1992Q4
USA	1984Q3	2006Q3	1984Q4	

Table G

Contemporaneous Effects of Foreign Variables on Domestic Counterparts

		y	Dp	r	epeps
Brazil	Coefficient	0.192324	-1.33877	0.459701	
Brazil	Standard error	0.276741	2.354726	18.47315	
Brazil	t-ratio	0.694959	-0.56855	0.024885	
Brazil	White's adjusted SE	0.272553	3.820494	14.33775	
Brazil	t-ratio_White	0.705638	-0.35042	0.032062	
Brazil	Newey-West's adjusted SE	0.255304	3.549113	14.4113	
Brazil	t-ratio_NeweyWest	0.753314	-0.37721	0.031899	
China	Coefficient	0.240903	0.384758	-0.00503	
China	Standard error	0.212193	0.15054	0.012795	
China	t-ratio	1.135297	2.55586	-0.3933	
China	White's adjusted SE	0.2681	0.128276	0.012551	
China	t-ratio_White	0.898554	2.999451	-0.40095	
China	Newey-West's adjusted SE	0.228088	0.139005	0.012041	
China	t-ratio_NeweyWest	1.056182	2.767943	-0.41793	
Euro	Coefficient	0.39825	0.18356	0.023036	
Euro	Standard error	0.070792	0.036917	0.013694	
Euro	t-ratio	5.625604	4.972299	1.682172	
Euro	White's adjusted SE	0.094336	0.047764	0.011218	
Euro	t-ratio_White	4.221605	3.843043	2.053413	
Euro	Newey-West's adjusted SE	0.109734	0.042038	0.01263	
Euro	t-ratio_NeweyWest	3.629219	4.366572	1.82392	
India	Coefficient	0.025697	0.196016	-0.00899	
India	Standard error	0.212941	0.18847	0.031899	
India	t-ratio	0.120677	1.040041	-0.28169	
India	White's adjusted SE	0.230392	0.143555	0.019499	
India	t-ratio_White	0.111536	1.365447	-0.46084	
India	Newey-West's adjusted SE	0.231371	0.14615	0.016391	
India	t-ratio_NeweyWest	0.111064	1.341202	-0.54822	
Nigeria	Coefficient	-1.33998	-0.0899	0.099427	
Nigeria	Standard error	0.444808	0.450077	0.031617	

Nigeria	t-ratio	-3.01249	-0.19975	3.144697
Nigeria	White's adjusted SE	0.432784	0.392649	0.033157
Nigeria	t-ratio_White	-3.09619	-0.22897	2.998704
Nigeria	Newey-West's adjusted SE	0.364555	0.334345	0.035912
Nigeria	t-ratio_NeweyWest	-3.67566	-0.2689	2.768605
South Africa	Coefficient	0.235074	0.327743	0.04425
South Africa	Standard error	0.106361	0.167175	0.055262
South Africa	t-ratio	2.210156	1.960476	0.800732
South Africa	White's adjusted SE	0.093112	0.153667	0.039348
South Africa	t-ratio_White	2.524645	2.132813	1.124586
South Africa	Newey-West's adjusted SE	0.089561	0.148664	0.030812
South Africa	t-ratio_NeweyWest	2.624737	2.204582	1.436142
United Kingdom	Coefficient	0.634885	0.469237	0.051334
United Kingdom	Standard error	0.120369	0.140162	0.070377
United Kingdom	t-ratio	5.274508	3.34781	0.729423
United Kingdom	White's adjusted SE	0.115676	0.141865	0.061682
United Kingdom	t-ratio_White	5.488486	3.307632	0.832245
United Kingdom	Newey-West's adjusted SE	0.131992	0.140937	0.060971
United Kingdom	t-ratio_NeweyWest	4.810021	3.329417	0.841943
USA	Coefficient	0.195618	0.074532	
USA	Standard error	0.091015	0.036032	
USA	t-ratio	2.149291	2.068517	
USA	White's adjusted SE	0.093879	0.027147	
USA	t-ratio_White	2.083731	2.745499	
USA	Newey-West's adjusted SE	0.095695	0.026649	
USA	t-ratio_NeweyWest	2.044168	2.796777	

Table: H

Countries and Region in the GVAR Model

Brazil	**EURO**
China	Belgium
India	France
Nigeria	Germany
South Africa	Italy
United Kingdom	Nertherlands
United States	Spain