International Competitiveness and Growth of the Nigerian Economy:

A Structural VAR-Based Perspective

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Abstract

The empirical relationship between international competitiveness of the Nigerian economy and its consequences on economic growth dynamics was investigated in this study. Using export performance and real effective exchange rate as proxies for international competitiveness of the Nigerian economy, the relationship between international competitiveness of the Nigerian economy and its growth dynamics have been analytically explored in this study using the structural VAR framework. The study found that growth of real output contemporaneously responds positively to a positive shock to real effective exchange rate but responded contrary to theoretical expectation in the opposite direction to a positive shock to export performance. The structural/orthogonalized impulse response analysis and the forecast error variance decomposition results were largely consistent with theoretical expectations as well as the short-run SVAR results. These results suggest that there are no serious misalignment issues with the Nigerian currency but cast doubt on the ability of the current export structure of the Nigerian economy to be growth inducing.

Keywords: International competitiveness, growth dynamics, Nigerian economy, SVAR.

1. Introduction

Competitiveness, since the dawn of the current trend of globalization in the 1980s, has become synonymous with the measure of performance or the potential of an economy. Thus, it has become elegant in the literature to project long-term growth and prosperity of an economy with reference to its state of competitiveness. According to World Economic Forum (2007:5), competitiveness is defined as the set of institutions, policies and factors that drive productivity and therefore set the sustainable current and medium-term levels of economic prosperity.

However, in determining the competitiveness of an economy, the macroeconomic, political, legal and social as well as microeconomic context needs to be considered. The latter involves improvement in the microeconomic capacity of the domestic economy and the sophistication of the local competition. Assessing the competitiveness of an economy based on macroeconomic framework is particularly important for small open economies, such as the Nigerian economy which relies on trade with the rest of the world in ensuring sustainable growth and development. Some of the macroeconomic factors that affect competitiveness include fiscal policy, local and foreign debt stocks, and monetary policy, external trade in goods and services, national savings, inflation, interest rate spread, real effective exchange rate as well as flow of development finances.

This paper focuses on the macroeconomic aspect of competitiveness of the Nigerian economy. Macroeconomic stability is an important element in the national competitiveness. In drawing inference from this statement, it is pertinent to note that the Monetary Policy Committee (MPC) of the Central Bank of Nigeria in 2008 observed that, although the Nigerian economy had achieved an appreciable level of stability, there were still some areas of concern including the upward oil and food prices movements, fiscal expansion and international financial conditions (CBN, 2008). These factors have implications for the performance of the economy, the transmission of international business cycles and even its competitiveness.

Consequently, this paper examines how competitive the Nigerian economy is in the face of domestic and international volatility. It also seeks to answer a number of research questions as follows: to what extent do uncertainties and volatility of the global economic environment impact on the growth of the Nigerian economy? What are the factors affecting the predictability of the Nigerian economy's competitiveness in the presence of shocks.

After the present introduction, Section 2 assesses the macroeconomic performance and competitiveness of the Nigerian economy. Section 3 of the paper presents a brief review of the literature on competiveness and growth while section 4 is concerned with the methodology and the empirical model. Section 5 contains the empirical analysis as well as the results and Section 6 is the conclusion.

2. Macroeconomic Performance and Competitiveness of the Nigerian Economy

Table 1 depicts the growth of GDP in recent years from 2001 to 2011 and some of its components. It shows that real GDP growth rate averaged 6.2 percent per annum during 2001-2005. This is in contrast to 7.4 percent in the period 2006-2010. This could indicate an improvement in the macroeconomic environment following higher oil export receipts and various policies to make the economy more investment-friendly. Inflation rate has dropped from an average of 15.7 percent in the first period to 10.1 percent in the second period. Persistence in this trend is expected to boost investment environment. The interest rate for most of the period remained below single digit, a development that is investment friendly. Growth rates of imports and exports have remained high averaging 33.5 percent and 28.9 percent during the first and second 5-year average respectively for import; and 41.6 percent and 39.4 percent during the first and second 5-year average respectively for exports. In addition, money supply has been growing at a very high rate reaching an average of 20.4 and 35.4 percent, respectively during the first and second period. Reserves in months were comfortably high over the periods averaging US$14303.4 million and US$45927.3million during the first and second period, respectively.

Table 1. Growth Rates of Selected Macroeconomic Variables (2001-2011)

year	infl	Yr	Imr	Exr	Inr	msr	res(US$m)	ds
2001	18.9	3.1	32.3	43.0	8.2	26.4	10646.6	5.8
2002	12.9	1.5	32.6	31.9	8.1	18.8	7566.806	2.8
2003	14.0	10.3	40.4	42.7	6.5	13.5	7415.087	2.7
2004	15.0	10.6	31.1	44.0	5.5	20.7	17256.54	2.2
2005	17.9	5.4	31.0	46.5	7.4	22.6	28632.05	9.0
5-year average	**15.7**	**6.2**	**33.5**	**41.6**	**7.1**	**20.4**	**14303.4**	**4.5**
2006	8.2	6.2	27.7	42.9	7.2	36.4	42735.47	4.9
2007	5.4	6.4	25.9	41.0	6.7	64.2	51907.03	0.8
2008	11.6	6.0	31.2	42.8	3.5	52.5	53599.28	0.3
2009	11.5	7.0	29.7	35.0	5.1	14.4	45509.82	0.3
2010	13.7	8.0	29.9	35.2	11.1	9.3	35884.93	0.2
5-year average	**10.1**	**6.7**	**28.9**	**39.4**	**6.7**	**35.4**	**45927.3**	**1.3**
2011	10.8	7.4	35.6	39.6	10.3175	13.6		0.2

Notes: infl: inflation; Yr: growth rate of real GDP; Imr: share of imports in GDP; Exr: share of exports in GDP; Inr: Interest rate

Source: *World Development Indicators, 2012*

The relative competitive position of the Nigerian economy in the global dimension can be viewed through a comparative analysis with similar economies within and outside the African continent. The term "competition" should not be seen as a zero sum game such as competition among companies in the "battle" for the larger share of the market within an economy. Instead, it must be viewed by comparing the drivers and the facilitators of

productivity improvement in similar other countries (Porter, 2008). In other words, nations compete in offering the most productive environment for business. Further, two factors can equally enhance competitiveness notably economic coordination among and economic integration with neighbouring countries.

In order to understand the relative competitiveness of the Nigerian economy, this paper refers to the Global Competitive Index (GCI), a composite index number, which is apparently the most comprehensive competitiveness index to date that measures the macroeconomic and microeconomic drivers of competitiveness among countries. In this respect, the GCI identifies nine pillars including: institutions (public and private); infrastructure; the macro-economic environment; health and primary education; higher education and training; goods market efficiency; labour market efficiency; financial market efficiency; technological readiness; market size; business sophistication; and innovation. According to Wikipedia (see: http://en.wikipedia.org/wiki/Competitiveness), competitiveness captures the awareness of both the limitations and challenges posed by global competition, at a time when effective government action is constrained by budgetary constraints and the private sector faces significant barriers to competing in domestic and international markets.

Monitoring the competitiveness ranking of an economy is a necessary ingredient in the process of policy formulation in modern small open economies. In this respect, this paper adopts the World Economic Forum (WEF) that publishes the Global Competitive Index (GCI), to place Nigeria among some comparable world economies. This index is made up of three components: the basic requirements (pillars 1-4); efficiency enhancers (pillars 5-10); and innovation and sophistication factors (pillars 11-12). Table 2 below shows the ranking of Nigeria among a total of 144 countries of the world. It also provides bases for comparing the Nigerian competitive position in relation to some intra-continental counterparts such as South Africa, Algeria and Egypt. When Nigeria is added to this group of countries they are given the acronym SANE. We also attempted a comparison of Nigeria's competitive situation with key emerging market economies comprising: Brazil, Russia, India and China (BRIC).

Based on the GCI 2013 as shown in table 2, it could be seen that Nigeria takes 120th position in the overall ranking among 144 countries. Among its peer countries, that is, SANE and BRIC, it is the lowest. In relation to its peers, Nigeria ranks lowest in basic requirements at 136th position, 3rd from the bottom in efficiency enhancer and 4th from the rear in innovation and sophistication factors.

In particular, when the 3rd pillar (macroeconomic stability) is put into focus, Nigeria's ranking stood at 46th position. On this factor, it is only the 4th best among the SANE and BRIC, but even ranks higher than U.K (115) and USA (117). On this score Egypt seems to be the worst of them all at 140th position followed closely by India at 110th, and South Africa at 95th position. Algeria came 3rd among the countries considered on this factor while it ranks 1st among the peer group (SANE) countries. In view of the macroeconomic difficulties adduced to in the preceding paragraph, it is surprising how Nigeria could have displaced U.K. and USA on the 3rd pillar. On a closer look at other pillars, it is evident that nowhere again has Nigeria's ranking close to the aforementioned developed economies. This shows that

although Nigeria's ranking is poor generally there is greater room for improvement on the macroeconomic stability criterion given its importance in the overall economic improvement.

Table 2. Global Ranking (Key Indicators 2012)

	Brazil	**Russia**	**India**	**China**	**S. Africa**	**Algeria**	**Egypt**	**Nigeria**
Basic Requirement	79	47	96	31	95	92	118	136
Efficiency Enhancers	44	51	42	31	34	133	109	83
Innovation and Sophistication Factors	46	99	41	34	37	143	104	82
Macroeconomic Environment	**75**	**19**	**110**	**10**	**95**	**34**	**140**	**46**
Budget balance (% GDP)	-2.8	0.4	-8.3	-2.2	-4.8	-2.7	-10.7	0.9
Gross National Savings (% GDP)	15.4	28.5	29.8	49.5	13.2	42.4	13.6	28.7
Inflation (annual % change)	5.4	5.1	9.3	5.42.7	5.7	8.9	8.6	12.2
General Government Debt (% GDP)	68.5	10.9	66.8	22.8	42.3	9.9	80.2	17.8
Country Credit rating 0 - 100	68.0	65.9	60.0	78.9	59.9	50.0	35.1	37.8
Overall Index	*56*	*64*	*60*	*29*	*53*	*100*	*118*	*120*

Source: Authors' calculation using data from Global Competitiveness Report 2012 – 2013

Table 3 shows the Nigerian economy within the global perspective in terms of economic activities: population, GDP, GDP per capita and the ratio of GDP to world total GDP. Nigeria's GDP is the third lowest among the countries considered and extremely low with respect to Brazil, China and Russia. The proportion of Nigeria's GDP to World GDP is estimated at 0.54 percent. This is a paltry value vis-à-vis that of China, 14.92 percent, and the USA, 18.87 percent. When the GDP per capita in US$ is considered, Nigeria is the second lower among the countries at US$1631. On the other hand, the annual real GDP growth rate stood at 8.0 percent in 2010 comparing favourably with other countries.

Table 3. Economic Activity (Key Indicators 2012)

	Brazil	Russia	India	China	S. Africa	Algeria	Egypt	Nigeria
Population (Million)	196.7	143.0	1241.5	1, 344.1	50.6	36.0	82.5	162.5
GDP (US & Billion)	2396.0	2022.0	1824.8	8,227.0	384.3	207.8	256.7	268.7
GDP (per capita US Dollar)	12,079	14247	1,492	6076	7.507	5,694	3112	1,631
GDP % of World Total	2.83	3.02	5.63	14.92	0.70	0.33	0.65	0.54

Source: WEF (2013), Global Competitiveness Report 2012 – 2013

In a further comparison of Nigeria's competitiveness with other countries, this paper reviews trade and foreign direct investment statistics of the countries considered. The data places Nigeria more squarely in terms of its importance in international trade reinforcing its smallness, dependency, peripheral nature, and business cycles taker. Nigeria's merchandise exports account for 0.52 percent of the total world exports. Based on these factors, Nigeria is ranked in the 42nd position compared to China 2nd, Brazil 22th, and South Africa 43th.

Its share in world merchandise imports is a meager 0.20 percent as against China 6.11 percent, Brazil 0.72 percent and South Africa 0.59 percent. According to table 4a, Nigeria's rank in

world imports was 53 behind China 2nd and South Africa 34nd. Imports are mainly raw materials, capital goods, and non-durable consumer items. Most of the imports are from the European Union, representing about 33 percent, while USA and China account for 15 percent and 7 percent respectively. Table 4 also shows that Nigeria is a marginal player in the flow of foreign direct investment. In 2005, FDI inflow to Nigeria was a paltry US$4978million and only 0.51 percent of the world total. Table 4b depicts the situation described above in 2010.

Table 4a. Nigeria Economy in the Global Context in 2005

	Brazil	Russia	India	China	S. Africa	Algeria	Egypt	Nigeria
Real GDP Growth	3.2	6.4	9.3	11.3	5.3	5.1	4.5	6.5
Trade to World Trade	0.92	1.79	1.13	6.67	0.57	0.31	0.14	0.36
Merchandise Export	118529	243799	99620	761953	56261	46002	10652	55145
Share in World Exports	1.13	2.32	0.95	7.2	0.54	0.44	0.10	0.52
Rank in World Exports	22	10	29	4	43	45	64	42
Merchandise import	77628	137977	142842	660206	64192	20357	19816	21314
Share in World imports	0.72	1.28	1.32	6.11	0.59	0.19	0.18	0.20
Rank in World imports	20	17	10	2	34	50	47	53
Services exports	16048	24970	52527	74404	5046	2507	14643	1793
Share in World exports	0.63	0.97	2.05	2.90	0.44	0.10	0.57	0.07
Services imports	24356	38745	47287	83796	12125	4783	10508	6624
Share in services imports	0.99	1.57	1.92	3.40	0.49	0.19	0.43	0.27
FDI (US$million)	15066	12886	7622	72406	6647	1081	5376	4978
%World FDI inflows	1.54	1.31	0.78	7.38	0.68	0.11	0.55	0.51
%LDCs FDI in flow	210	180	106	1009	93	15.1	75	69

Source: UNTAD Handbook of Statistics (2013)

Table 4b. Nigeria Economy in the Global Context in 2010

	Brazil	Russia	India	China	S. Africa	Algeria	Egypt	Nigeria
Real GDP Growth (%)	7.5	4.3	9.6	10.4	2.8	3.33	5.1	7.8
Trade to World Trade (%)	1.28	1.02	1.87	9.96	0.59	0.32	0.26	0.40
Merchandise Export	201915	400420	226392	1578270	85700	57050	26437	77844
Share in World Exports (%)	1.32	2.62	0.95	10.3	0.56	0.37	0.17	0.51
Merchandise import	191537	273614	350098	1396200	96249	41000	52923	44129
Share in World imports	1.24	1.77	2.27	9.05	0.62	0.27	0.34	0.29
Services exports	31821	44981	123762	171203	14004	3566	23807	3081
Share in World exports	0.83	1.17	3.23	4.46	0.37	0.10	0.62	0.08
Services imports	62592	73682	116842	193321	18456	11906	14718	21332
Share in services imports	1.70	2.0	3.17	5.25	0.50	0.32	0.40	0.58
FDI (US$ million)	48507	43288	24159	114734	1228	2264	6386	6099
%World FDI inflows	3.71	3.31	1.85	8.77	0.09	0.17	0.49	0.47
%LDCs FDI in flow	287	256.15	142.96	678.93	7.27	13.40	37.79	36.09

Source: UNTAD Handbook of Statistics (2013)

3. A Brief Review of the Literature on Competiveness and Growth

An appropriate definition of competiveness is often elusive to conceive as the term itself is subject to many interpretations or even abuse in the literature. However, a number of definitions have been attempted in the literature. Martin et al. (2006) provide a framework that describes competitiveness as a firm's capacity to compete, grow and be profitable. Competitiveness has also been defined in a broader sense as the inclination and skills to compete, to win and retain position in the market, to increase market share and profitability, and eventually to consolidate commercially successful activities (Filó, 2007). There is no doubt that the Filó definition of competitiveness is also very appropriate to the firm-level competition as it directly gives the impression of entities in a winner-loser relationship. However, its usefulness becomes highly debatable when applied to national economies. This is because competition between countries is largely regarded as potentially mutually beneficial, while competition between companies within the same industry is more often a zero sum game (Krugman, 1996). There is also the concept of regional competitiveness which according to Meyer-Stamer (2008) is the ability of a locality or region to generate high and rising incomes and improve livelihoods of the people living there. This definition is welfare oriented as it places an emphasis on the close link between competitiveness and prosperity for a people living within a specific region. The World Economic Forum (WEF) defines national competitiveness as the set of institutions, policies and factors that determine the level of productivity of a country (Schwab and Porter, 2007).

It regards productivity as what is required to set the sustainable level and path of prosperity that a country can achieve. This means that the level of income of country's citizens will tend to grow with the level of competitiveness of the economy. Competitiveness of an economy is also closely associated with the rates of return to investment (a key driver of economic growth) in the economy. The more competitive an economy is, the more likely it is to grow faster over the medium to long term. The WEF definition of competitiveness is adopted as the working definition for this study. This is because it provides the links between the micro (firm-level) and macro (country-level) competitiveness.

A number of authors include the variables real exchange rate (RER), real effective exchange rate (REER) and export unit values (export prices) as measures of trade competitiveness based on relative prices and costs (see: Durand and Giorno 1987; Turner, Philip, and Jozef van't dack 1993; and Marsh and Tokarick 1994). These three measures are essentially measures of trade performance that capture prices or costs of the portions of the economy that are exposed to international competition, and they use a measure of exchange rates to convert prices or costs into a common currency. Moreover, the real exchange rate, as well as the real effective exchange rate (REER), are used as measures of the degree of misalignment of the currency which enhances or reduces international competitiveness of the affected economy.

The importance of international trade in economic growth cannot be over-emphasized. Interestingly, Ezeala-Harrison (1999) described international trade as the engine of economic growth and international competitiveness as the fuel that empowers that engine to run. Hatsopoulos, Krugman and Summers (1990), argues that competitiveness of economies

translates into trade balance with rising living standard or real income. However, they contend also that export success can also be achieved at the cost of diminished real income, in which case does not reflect competitiveness. When export success is accompanied with a constant level of welfare gain then an economy will be said to be competitive.

A country's market share of exports and their accompanying economic benefits can only be maintained if the required level of competitiveness is retained. Cas (1988) believes that export competitiveness of a country is closely associated with its trade performance. Rugman and D'Cruz, (1989) asserted that a country that suffers a loss in its export share or gets increased import penetration has become less competitive. Some authors have cautioned on the interpretation of the link between trade performance and export competitiveness which should never be misconstrued as this really does not exist, this is because both terms are equal at the country level. Markusen (1987) showed that such misconception resulted in large current account deficits in the U.S. during the 1980's as it was interpreted as a loss of U.S. competitiveness, which was not so anyway. According to Ezeala-Harrison (1995), results that are in conflict with the definition of productivity are often generated by a notion of competitiveness that is based on the trade performance definition.

From the literature, it is clear that international competitiveness of an economy is vital for trade and may be seen as analogous to a country's export performance. Moreover, the goal of every policy on trade competitiveness at the country level is to improve the wellbeing of the people.

4. Methodology

The seminal study of Sims (1980) set the basis for VAR analysis in econometrics. The standard VAR analysis makes it possible to direct both the relative meaning and the dynamic effect of various disturbances on macroeconomic variables, by describing how a set of time series data was generated by random innovations in variables of interest. A standard vector autoregression (VAR) model is equivalent to a reduced form model where no explanations of the instantaneous relationships among variables are provided. These instantaneous relationships are naturally hidden in the error structure, and are therefore left completely un-interpreted.

Cooley and Leroy (1985) criticized the standard VAR methodology because of its lack of theoretical meaning or identification system. They argued that Sims did not openly justify the identification restrictions and asserted that a model recognized by this arbitrary procedure cannot be interpreted as a structural model. This is because different variable arrangements are likely to generate different structural parameters. They suggested that improving the structural parameters from an estimation procedure would require some restrictions. The Cooley and Leroy's critique of Sims work on VAR models has since triggered further research by macroeconomists whose main emphases have been on the issue of identifying restrictions.

Sims (1981, 1986), Bernanke (1986), and Shapiro and Watson (1988) put forward a new

class of econometric models that is now known as *structural vector autoregression* (SVAR) or *identified VAR*. Instead of identifying the (autoregressive) coefficients, identification in SVAR focuses on the errors of the system, which are interpreted as (linear combinations of) exogenous shocks. In addition, the SVAR brings multiple time-series analysis and economic theory together and helps to determine the dynamic response of estimated variables to various shocks that take place within an economy. In view of the strengths of the SVAR model, the general model of SVAR as advanced by Amisano and Giannini (1997) is employed in this study.

We begin the model specification by considering a system of simultaneous equations implied in vector form as follows:

$$By_t = \delta_0 + A(L)y_{t-1} + M\varepsilon_t \qquad (1)$$

Where:

y_t is a vector of endogenous variables,

δ_0 is the constant term,

y_{t-1} is a vector of lagged values of y_t,

ε_t is a vector of random error of the disturbance terms

B is the square matrix of dimension (n×n), containing the structural parameters of the contemporaneous endogenous variables,

A(L) is a matrix polynomial in the lag operator L of length p, and

M is the square matrix (n×n) dimension. M contains the contemporaneous response of the variables to the innovations.

The first stage of SVAR analysis is the estimation of the reduced form or the standard VAR. As the coefficients in the matrices of equation (1) are unknown and the variables have temporary effects on each other, the model in this form cannot be completely identified. But, it may be transformed into a reduced-form model by multiplying both sides of the equation by the inverse matrices of B, which brings about the standard VAR representation as:

$$y_t = \alpha_0 + D(L)y_{t-1} + e_t \qquad (2)$$

Where: $\alpha_0 = B^{-1}\delta_0,$ $\qquad D(L) = B^{-1}A(L)$ and $e_t = B^{-1}M\varepsilon_t$

The error terms e_t are linear combinations of the orthogonalized shocks (ε_t), such that each individual error term is serially uncorrelated and has a zero mean and a constant variance. Note that e_t is different from the disturbance terms ε_t and the error terms in e_t are correlated with each other. Hence, this raises a dilemma that bothers on the recovering of the underlying structural disturbances from the estimated VAR. In VAR analysis the only source of variation of y_t variables is indicated by a vector of white noise e_t, usually called a vector of innovations (Amisano and Giannini, 1997).

We adopt a methodological approach that is consistent with those used in most applied SVAR studies, that includes estimating: the reduced form model; the short-run SVAR models; the long-run effect; the impulse-response function (IRF); and the forecast error variance of decomposition (FEVD). The SVAR framework is generally focused on how the innovations to one endogenous variable affect other endogenous variables. Also SVAR analysis is focused on the direction of instant correlation between innovation variables. Having short-run or long-run restrictions in the model only depends on whether shocks are transitory or permanent. Hence, we examine both the short-run and long-run SVAR models.

4.2 Model Specification and Identification of Restrictions

The SVAR model adopted in this study is applicable to a developing small open-economy. This SVAR model is comprised of a system of three equations, depicting the relationship between the major indicators of international competitiveness and the growth of the Nigerian economy. These include: the growth rate of real output or GDP (*grwt*), the real effective exchange rate (*reer*), and export performance measured by the ratio of Nigerian export to world export (*xpfm*). Data for these variables covering the period 1980 – 2012 were sourced from the World Bank World Development Indicators, online. Although the sample period appears a short time span (due to constraint of data availability) for robust results, we proceeded with the analyses since 33 observations satisfy the statistical requirement of a large sample size

Equation (1) is called a structural VAR as it is assumed to be determined by some underlying economic theory. Thus the structural model of this study is described by the following dynamic system of simultaneous equations (3 - 5):

$$
\begin{aligned}
Reer_t = a_{10} &- b_{12}xpfm_t - b_{13}grwt_t + \sum_{i=1}^{p} a_{11}^i\, xpfm_{t-i} + \sum_{i=1}^{p} a_{12}^i\, grwt_{t-i} + \sum_{i=1}^{p} a_{13}^i\, reer_{t-i} \\
&+ \varepsilon_t^{reer}
\end{aligned}
\tag{3}
$$

$Xpfm_t$

$$= a_{20} - b_{22} reer_t - b_{23} grwt_t + \sum_{i=1}^{p} a_{21}^i reer_{t-i} + \sum_{i=1}^{p} a_{22}^i grwt_{t-i} + \sum_{i=1}^{p} a_{23}^i xpfm_{t-i}$$

$$+ \varepsilon_t^{xpfm} \tag{4}$$

$Grwt_t$

$$= a_{30} - b_{32} xpfm_t - b_{33} reer_t + \sum_{i=1}^{p} a_{31}^i xpfm_{t-i} + \sum_{i=1}^{p} a_{32}^i reer_{t-i} + \sum_{i=1}^{p} a_{33}^i grwt_{t-i}$$

$$+ \varepsilon_t^{grwt} \tag{5}$$

$$Where \begin{pmatrix} \varepsilon_t^{reer} \\ \varepsilon_t^{xpfm} \\ \varepsilon_t^{grwt} \end{pmatrix} \sim i.i.d. \left(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_{reer}^2 & 0 & 0 \\ 0 & \sigma_{xpfm}^2 & 0 \\ 0 & 0 & \sigma_{grwt}^2 \end{pmatrix} \right)$$

The variables: $reer_t, xpfm_t$ and $grwt_t$ are endogenous variables. The exogenous error terms: $\varepsilon_t^{reer}, \varepsilon_t^{xpfm}$, and ε_t^{grwt} are independently and identically distributed with mean zero and a constant variance (σ^2). The exogenous error terms may be interpreted as structural innovations. The realization of each structural innovation is known as capturing unexpected shocks to its dependent variable respectively, which themselves are uncorrelated with the other unexpected shocks (ε_t). In equations (3 – 5), the endogeneity of $reer_t, xpfm_t$ and $grwt_t$ is determined by the values of coefficients, b.

The model (3 – 5) can be re-written in matrix form as follows:

$$\begin{bmatrix} 1 & b_{12} & b_{13} \\ b_{21} & 1 & b_{23} \\ b_{31} & b_{32} & 1 \end{bmatrix} \begin{bmatrix} reer_t \\ xpfm_t \\ grwt_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \\ a_{30} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} reer_{t-i} \\ xpfm_{t-i} \\ grwt_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_t^{reer} \\ \varepsilon_t^{xpfm} \\ \varepsilon_t^{grwt} \end{bmatrix},$$

Where i=1,2,….,n.

The reduced form of the VAR model in equation (2) is to be estimated first. This model does not have the instantaneous endogenous variables and is shown in equations (6 – 8) as follows:

$$reer_t = a_{10} + \sum_{i=1}^{p} d_{11}^i \, xpfm_{t-i} + \sum_{i=1}^{p} d_{12}^i \, grwt_{t-i} + \sum_{i=1}^{p} d_{13}^i \, reer_{t-i} + e_t^{reer} \qquad (6)$$

$$xpfm_t = a_{20} + \sum_{i=1}^{p} d_{21}^i \, xpfm_{t-i} + \sum_{i=1}^{p} d_{22}^i \, grwt_{t-i} + \sum_{i=1}^{p} d_{23}^i \, reer_{t-i} + e_t^{xpfm} \qquad (7)$$

$$grwt_t = a_{30} + \sum_{i=1}^{p} d_{31}^i \, xpfm_{t-i} + \sum_{i=1}^{p} d_{32}^i \, grwt_{t-i} + \sum_{i=1}^{p} d_{33}^i \, reer_{t-i} + e_t^{grwt} \qquad (8)$$

The coefficients, *a*, of the lagged variables in the structural VAR model vary from the coefficients, *d*, of the lagged variables in the reduced form VAR model. Without imposing a number of restrictions, the parameters in the SVAR model (3 – 5) cannot be identified. These restrictions will allow for the contemporaneous interaction between international competitiveness variables and growth dynamics of the Nigerian economy.

To impose restrictions, we can use short run SVAR models where current values affect each other (contemporaneous effect), meaning such changes have no long lasting effect; or long run SVAR models where one variable has a long lasting effect in which case, such variable does not return to its initial level. For the short run model, restrictions have to be placed on the A and B matrix, where A matrix is the one for emphasis. The B matrix places restrictions on the error structure. In order to identify a shock to the global competitiveness of the Nigerian economy, only the short-run parameter restrictions are applied in this study. This is because shocks to the competitiveness variables included in this study tend to be temporary (in which case variables tend to return to their initial levels after a shock) rather than permanent (in which case variables do not return to their initial levels over time after a shock). This is evident in the orthogonalised/structural impulse response functions where the response of the variable growth to shocks to export performance and real effective exchange rate tends to die out quickly within five periods.

Depending on the imposed restrictions, three types of SVAR models can be distinguished:

❖ A model: B is set to I_n

(Minimum number of restrictions for identification is $(n^2 - n)/2$).

❖ B model: A is set to I_n

(Minimum number of restrictions to be imposed for identification is $(n^2 - n)/2$).

❖ AB model: restrictions can be placed on both matrices

(Minimum number of restrictions for identification is: $n^2 + (n^2 - n)/2$).

Given matrix A and matrix B, and.

$$Let: A\varepsilon_t = Be_t \qquad (9a)$$

We may proceed to impose restrictions on matrices A and B. As previously defined, ε_t are

the VAR residuals, and e_t are the structural shocks. Based on relevant theoretical

expectations, we assume a recursive ordering scheme. Therefore, setting A to a lower triangular matrix, and B to a diagonal/identity matrix, corresponds to a Choleski decomposition. The resulting parameter restrictions for the short run SVAR model specified in equations (3 – 5) are:

$$\begin{bmatrix} 1 & 0 & 0 \\ a_{21} & 1 & 0 \\ a_{31} & a_{32} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{reer} \\ \varepsilon_t^{xpfm} \\ \varepsilon_t^{grwt} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 \\ 0 & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} e_t^{reer} \\ e_t^{xpfm} \\ e_t^{grwt} \end{bmatrix} \qquad (9b)$$

$$\text{VAR residuals} \qquad\qquad \text{structural shocks}$$

This implies that the *reer* equation does not contain contemporaneous values of *xpfm,* or *grwt*. So real effective exchange rate is not contemporaneously affected by export performance or growth of real output. Similar explanations apply to the other equation.

Another way of considering equation (9a) is as follows:

$$\varepsilon_t = A^{-1}Be_t \qquad (10a)$$

The resulting parameter restrictions for the short run SVAR model specified in equations (3 – 5) become;

$$\begin{bmatrix} \varepsilon_t^{reer} \\ \varepsilon_t^{xpfm} \\ \varepsilon_t^{grwt} \end{bmatrix} = \begin{bmatrix} a & 0 & 0 \\ b & c & 0 \\ d & e & f \end{bmatrix} \begin{bmatrix} e_t^{reer} \\ e_t^{xpfm} \\ e_t^{grwt} \end{bmatrix} \qquad (10b)$$

The variable, *reer* in this case does not respond contemporaneously to structural shocks to *xpfm,* or *grwt*. Export performance (*xpfm*) responds contemporaneously to structural shocks to *reer,* itself but not to *growth (grwt).* In a similar vein, growth of real output (*grwt*) responds contemporaneously to structural shocks to *reer, xpfm* and itself.

5. Estimation and Results

Five variables were originally included in the specified empirical models these variables included trade openness and rate of inflation as well as the three variables included in equations (3 – 5). However, trade openness and rate of inflation were later dropped because the reduced form model failed to perform well with the inclusion of these two variables. Specifically, the estimated reduced form model was plagued with autocorrelation and also failed the VAR stability test.

Estimations began with the determination of the time series properties of each variable included in our estimation model. The Augmented Dickey Fuller (ADF) test for unit root revealed that *grwt, reer* and *xpfm* were individually *I(0)*. The unit root test result is presented in Table 5(a).

Table 5(a). Unit Root Test Results for Stationarity of Variables

Variable	Test statistic	ADF critical value			Order of integration	Remark
		1%	5%	10%		
grwt	-2.964	-3.716	-2.986	-2.624	*I(0)*	Stationary at level
xpefm	-2.781	-3.709	-2.983	-2.623	*I(0)*	Stationary at level
reer	-2.631	-3.709	-2.983	-2.623	*I(0)*	Stationary at level

Note: all series are each stationary at level only when the 10% ADF critical value is applied
Source: Authors' computation using STATA 11

The unit root test was followed by the selection of optimal lag length using different selection criteria. The lag order of the VAR model was determined using the Akaike (AIC) and Hannan–Quinn (HQIC) information criteria. The results which are summarized in Table 5(b) strongly favoured four lags based on the AIC, HQIC, and even the FPE criteria. In this case the lag order that minimizes the value of the information criterion is selected as the optimum lag length.

Table 5(b). Lag Selection-Order Criteria

Sample: 1984 - 2012				Number of Obs		=	29
lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-237.426				3189.29	16.5811	16.6254	16.7225
1	-195.644	83.564	9	0.000	334.267	14.3203	14.4975	14.886
2	-178.931	33.426	9	0.000	201.112	13.7883	14.0984	14.7785
3	-155.736	46.39	9	0.000	80.1707	12.8094	13.2524	14.2238*
4	-141.089	29.294*	9	0.001	61.0624*	12.4199*	12.9958*	14.2587

Endogenous: reer xpfm grwt
Exogenous: _cons
Source: Authors' computation using STATA 11

The underlying VAR model was then estimated and relevant tests to determine its suitability were conducted. The Lagrange-Multiplier (LM) Test result presented in Table 6 strongly

rejected the null of autocorrelation. The underlying VAR also satisfied the stability condition as all the eigenvalues were within the unit circle.

Table 6. Lagrange-Multiplier Test

lag	chi2	df	Prob > chi2
1	7.0927	9	0.62747
2	4.7013	9	0.85953
3	5.7142	9	0.76815
4	11.2441	9	0.25935

H0: no autocorrelation at lag order
Source: Authors' computation using STATA 11

Results for the estimated B-model are presented in Table7 below. We employed the recursive Cholesky restriction to identify the non-zero parameters above the growth of real output (*grwt*) equation.

Table 7. Estimated Coefficients of the Short-Run Variables

	REER	XPFM	GRWT
REER	1	0	0
XPFM	-0.00080679 (0.00027)*	1	0
GRWT	0.0407693 (0.010227)*	-23.303568 (5.89507)*	1

Note: *indicates significant at one percent level
Source: Authors' computation using STATA 11

The variable *REER* is thought of in this study as being determined by some exogenous factors only, such as the international prices of crude oil that is determined externally by international market conditions, (crude oil is Nigeria's major export commodity). In this case, response of *REER* to own shock is restricted to one. A look at other variables contained in the results shown in Table 7 suggest that given a positive shock to real effective exchange rate (a measure of international competitiveness), export performance will respond contemporaneously with a marginal but significant decline. This is surprising given that an increase in exchange rate is analogous to a depreciation of the domestic currency. There are two possible explanations here. First, in the short run, firms may not have enough time to adjust sufficiently in response to this positive real effective exchange rate shock hence the marginal decline in export performance is indicative of loss in export value. The second explanation is connected with the low capacity of the Nigerian economy to produce tradable goods that will be competitive in the international market. This possibility may severely hinder the ability of the economy to respond adequately to a positive exchange rate shock. Response of export performance to own shock is restricted to one.

The growth of real output (*GRWT*) variable contemporaneously responds in the same direction to a positive shock to real effective exchange rate (REER) or international competitiveness. This is expected as it suggests that a depreciation of the domestic currency

immediately induces an expansion of real output within the Nigerian economy. It also suggests that there are no serious misalignment issues with the Nigerian currency. The growth of real output (*GRWT*) variable, in contrast, contemporaneously responds in the opposite direction to a positive shock to export performance (XPFM), another measure of international competitiveness. Surprisingly, this result` is unexpected. In view of the above findings, it will be useful to remark at this point that this study has provided mixed evidence in support of the argument that international competiveness of the Nigerian economy is growth inducing within the short run horizon. While the real effective exchange rate follows the path of theoretical predictions by inducing growth when there is a depreciation of the local currency, the short-run role of export performance in explaining growth of the Nigerian economy surprisingly does not follow the prediction of theory. Given that natural resources dominate the exports of the Nigerian economy, one may then curiously ask whether the explanation for this finding is hidden in the export composition of the Nigerian economy. One other important question to ask also is how consistent are these findings with most other related studies?

5.1 Structural Identification Scheme

The impulse responses using the structural model specified in equations (3 – 5) are examined and discussed next. This is to further examine the dynamics of responses of each variable in the specified model to shocks to other variables over time. The IRFs in this case provide additional insights into the relationship between international competiveness of the Nigerian economy and real output growth. From figure 1, a shock to real effective exchange rate temporarily increases export performance. This positive response gradually declines until the fourth period when it hits its steady state value. Beyond period four, export performance falls below its steady state value and remains in the negative region until it dies out after period ten.
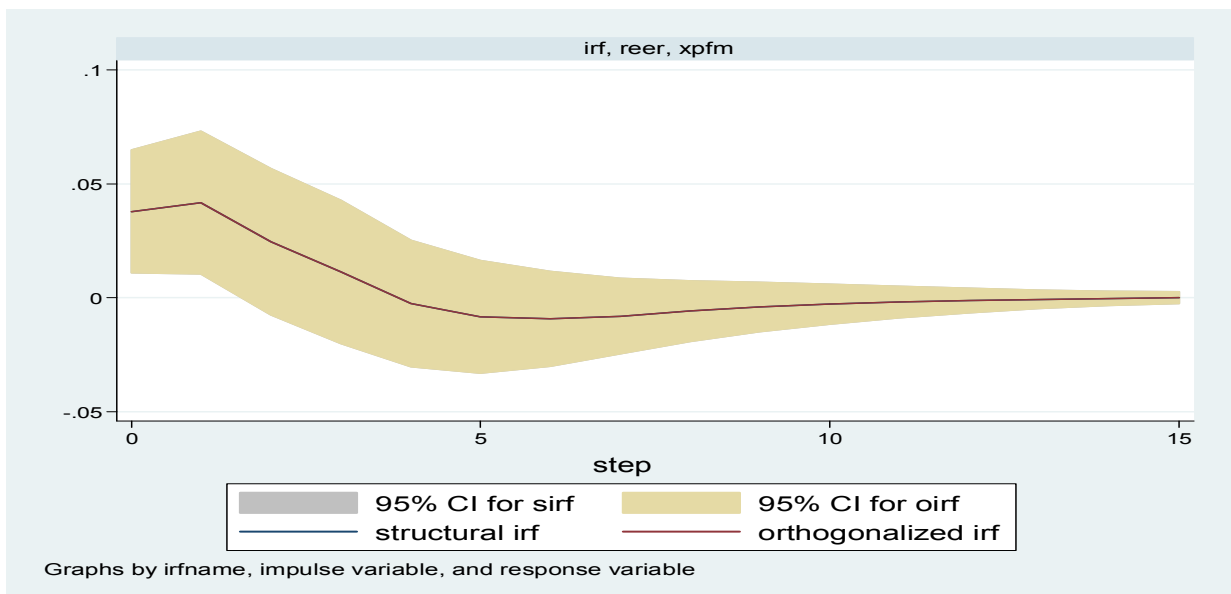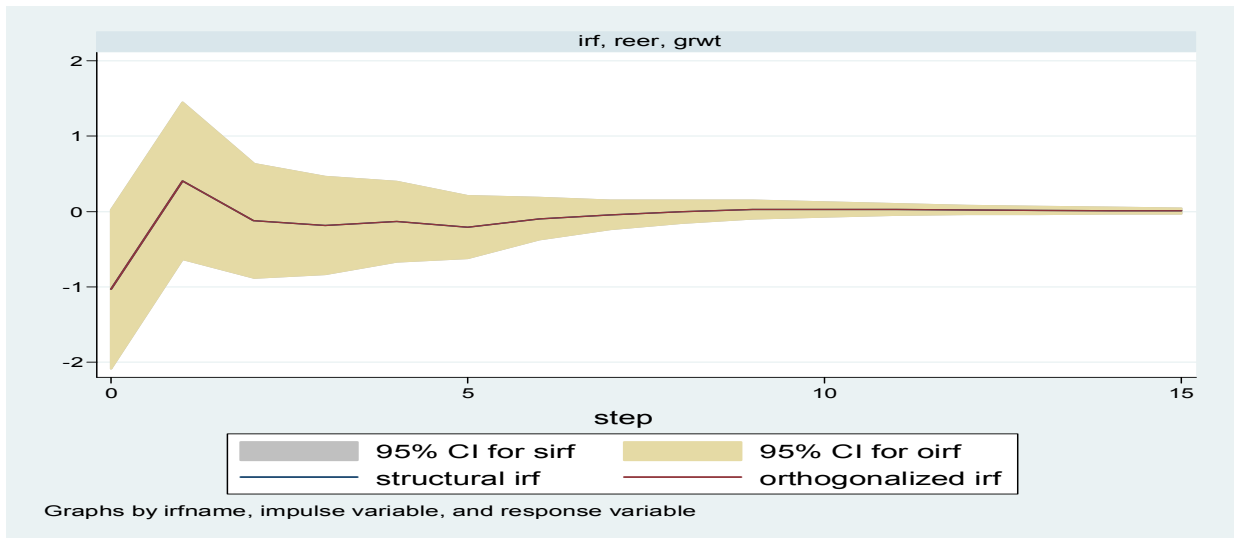

Figure 1. Response of export performance to a shock to real effective exchange rate, using structural and orthogonalised IRF

The response of real output growth rate to a shock to real effective exchange rate is shown in figure 2. Real output growth rate initially responded negatively to a shock to real effective exchange rate but crossed its steady state value to the positive region in period two. Period three to eight saw real output growth rate return to the negative region before it finally disappeared around its steady state value. This result suggests that the future path of real output growth in Nigeria as a response to a positive shock to real effective exchange rate will remain similar to the contemporaneous results presented in Table 7 which is largely consistent with theoretical expectations.

Figure 2. Response of real output growth rate to a shock to real effective exchange rate, using structural and orthogonalised IRF

Response of real output growth rate to a shock to export performance also exhibited some transitory phenomenon as shown in figure 3. Real output growth rate responded positively to a positive shock to export performance in the first and third period following a shock to export performance. But this response crossed to the negative region in period four and remained there around its steady state value until the eight period when it began to die out.
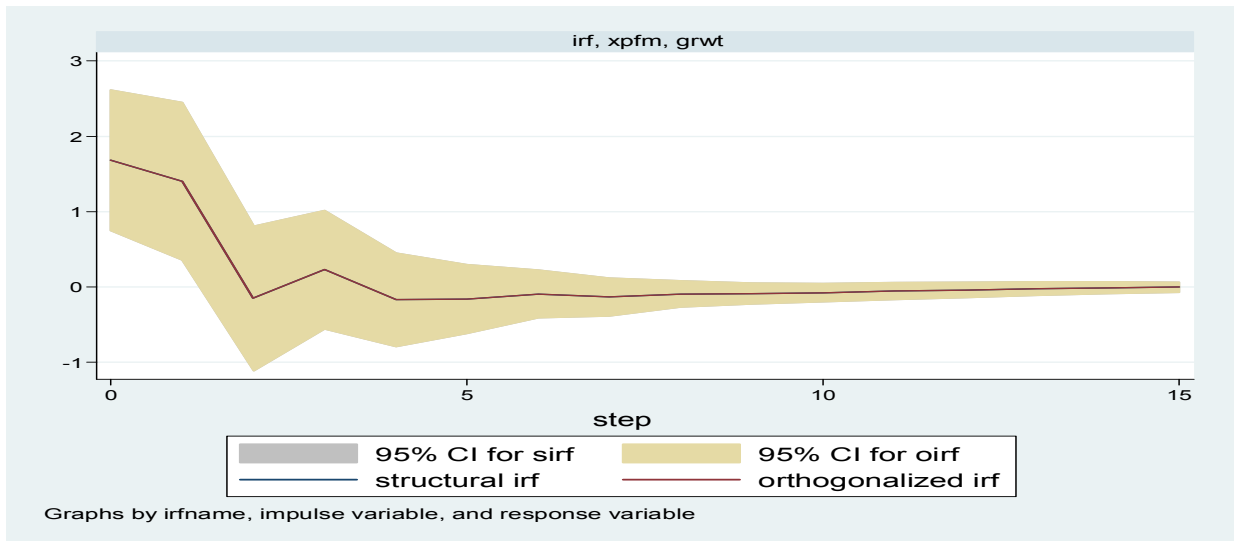
Figure 3. Response of real output growth rate to a shock to export performance, using structural and orthogonalised IRF

When the above IRF results are compared with those of the structural parameters presented in Table 7, it immediately becomes clear that the estimates of the structural parameters are still subject to change over time. Real output growth will temporarily respond in line with theoretical predictions in the first few periods after a shock to export performance. This will however be short-lived as real output growth again falls into its negative region in the periods beyond the third. Therefore, the impulse response analyses are much more informative than those of the structural parameter estimates. Responses to own shocks by the three variables (*reer, xpfm* and *grwt*) exhibited transitory patterns similar to the ones presented above. These are however not reported here due to constraint of space but can be made available on request.

While the impulse response function allows a researcher to examine responses from a given variable induced by a shock to another or the same variable, the forecast error variance decomposition (FEVD) provides further evidence of interaction, by quantifying the contribution of the different shocks to the variance in the relevant variables on *impact*. In other words, the FEVD tells how much of a change in a variable is due to its own and other variables shocks. The results of the FEVD are presented in Table 8

Table 8. Forecast Error Variance Decomposition

Period	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	1	.216266	.112108	0	.783734	.297572	0	0	.590319
2.	.948835	.296758	.105751	.000734	.703236	.412396	.050431	5.8e-06	.481853
3.	.874394	.284774	.105044	.013131	.712457	.40661	.112475	.002769	.488346
4.	.837295	.268613	.106724	.020874	.728479	.406764	.141831	.002908	.486512
5.	.825245	.257369	.107805	.02084	.735951	.407522	.153915	.00668	.484673
6.	.822606	.251391	.110614	.022712	.735859	.40704	.154682	.01275	.482346

(1) impulse = reer, and response = reer
(2) impulse = reer, and response = xpfm
(3) impulse = reer, and response = grwt
(4) impulse = xpfm, and response = reer
(5) impulse = xpfm, and response = xpfm
(6) impulse = xpfm, and response = grwt
(7) impulse = grwt, and response = reer
(8) impulse = grwt, and response = xpfm
(9) impulse = grwt, and response = grwt

Source: Authors' computation using STATA 11

The column labelled (2) shows forecast error variance decomposition of export performance for periods one to six with respect to real effective exchange rate shock. In period one of column (2) for instance, real effective exchange rate shocks explain about 29.68 percent of export performance variation on impact. In the column marked (3) for period one, a shock to real effective exchange rate triggered about 11.21 percent variation in growth rate of real output. These figures are indicative of a modest degree of interaction. In the column marked (6), a fairly more important degree of interaction can be observed with shocks to export performance accounting for about 26.76 percent and 41.24 percent of the variations in growth rate of real output in periods one and two respectively. It is important to first note here that although the variables in Table 8 relate to the same set of variables presented in Table 7, the FEVD results differ fundamentally from the estimates of the structural parameters in that FEVD results represent out–of–sample values. However, the relatively high degree of variation of the variable *grwt* in response to a shock to export performance requires some further comments. What this result suggests is that the present structure of exports from Nigeria will continue to induce less growth of the economy in subsequent periods. This raises some important questions on the quality of utilization of crude oil export proceeds by the Nigerian state.

6. Concluding Remarks

The relationship between international competitiveness of the Nigerian economy and its growth dynamics have been analytically explored in this study using the structural VAR framework. The major findings that we consider both interesting and intriguing revealed some evidences of the existence of largely transitory relationships. Using export performance and real effective exchange rate as proxies for international competitiveness of the Nigerian economy, the study found that growth of real output contemporaneously responds in the same direction to a positive shock to real effective exchange rate. The growth of real output contemporaneously responds in the opposite direction to a positive shock to export performance. The study also found that a positive shock to real effective exchange rate instantaneously induces a marginal but significant negative response from export performance. The structural/orthogonalised impulse response analysis and the forecast error variance decomposition results were in many cases consistent with the short-run SVAR results suggesting that the structural estimates are sustainable over time. These also proved much more informative than the structural parameter estimates obtained from the short-run SVAR.

Apart from the growth – exports nexus, all the findings were individually consistent with theoretical expectations. The first possible explanation for the unexpected nature of results for the growth-export performance link is the dominance of crude oil in the export structure of the Nigerian economy. The second explanation may be indicative or strongly suggestive of poor utilization of export proceeds by the Nigerian state. These findings have implications for policy as follows; the current policy on foreign exchange may be continued as the study results have shown that there are no serious misalignment issues with the Nigerian currency. However, a policy of divestment from exports of primary products is required to make exports of the Nigerian economy more growth-oriented. There is also the need to pursue a policy that emphasizes real output growth in the utilization of revenue from crude oil exports. Such areas of emphasis should include massive investment in public infrastructure and other drivers of growth such as roads, energy, security, education and health.

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