Export Instability and Economic Growth in Nigeria: A Time Series Analysis

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Abstract

Primary products and commodities are sources of raw material, and provide food and livelihood for many families and communities. They also provide export earnings and income for many governments in developing countries. In Nigeria, and other sub-Saharan Africa countries, primary products and commodities are at the heart of local economies and sometimes national economies. However, over the years, prices of primary products and commodities have been very volatile, with serious implications for economic growth.

As a response, this study investigates the impact of export instability on economic growth in Nigeria using time series data from 1970q1 to 2011q4 and an econometric approach that addresses the problem of non-stationarity. As a departure from previous studies, the paper uses an instability measure that varies over time and a relatively large data sample size. Our results show that export instability has negative effects on economic growth and investment.

The policy recommendation is that to smoothen Nigeria's financial standing in the short run, the government should ensure the national sovereign wealth fund (NSWF) is properly managed given the unpredictability of the global export market. A long term strategy is the continuation and intensification of government efforts to diversify the export base of the country. The export sub-sector should be diversified by increasing the share of non-traditional exports.

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1. Introduction

Overview

International trade theory opines that developing countries would benefit from primary product specialization because of the existence of comparative advantages and the utilization of the countries' relative abundant factors. However, international specialization by developing countries implies a high commodity dependence, which has been criticized by many development economists. One of the major criticisms is the unpredictability of products and commodity prices, which has serious implications for export earnings.

Over the years, the structure of international trade has changed in favour of manufacturing. However, primary commodities still remain extremely important for Nigeria and other developing countries in sub-Saharan Africa. Many African countries still depend on a small basket of primary commodities for exports and foreign exchange. . Nigeria, like some other developing countries, is predominantly dependent on oil (crude oil and gas) and a small number of non-oil products (such as cocoa, rubber, etc) for foreign exchange. Due to their inherent peculiarities, primary products continue to face extreme price volatility in the short run and a downward trend in the long run . As a result, the income of many developing countries , continues to be adversely affected.

According to the UNCTAD (2003) report, instability in export earnings has severely impaired growth in many developing countries, particularly in Africa, and continues to impede governments' capacity for lifting their population out of abject poverty. In fact, from the report, every dollar lost in export earnings in these developing countries translates into a two-dollar loss in gross domestic product. Findings and estimates from the UNCTAD report show that "if prices for the 10 most important agricultural commodities (in terms of export values) exported by developing countries had risen in line with inflation since 1980, these exporters would have received around US$112 billion more in 2002 than they actually did". This was considered more than twice the total amount of aid distributed worldwide.

Currently, there is growing evidence that instability of earnings from exports is one of the major causes of economic instability in many developing countries. The source of exports instability may be fluctuations in foreign demand conditions, domestic supply, perhaps climatic change, or a combination of these factors. Fluctuations in exports primarily affect domestic income, domestic spending (or government revenue) and probably long term incentives to invest. Also, frequent and sudden changes in prices of primary commodities often cause short-term fluctuations in export earnings and can be

detrimental to economic growth when they disrupt development programmes, because the actual supply of foreign exchange falls short of the projected supply.

Although there is an increasing concern among policy makers on the impact of export earning instability on economic growth in developing countries, most empirical literature has focused on large open economies and developing countries in Asia. Little attention has been given to the effects of export instability on economic growth in small open economies. Apart from methodological concerns and issues, other criticisms of the previous studies are that many of these studies are cross-sectional, used univariate analysis, and findings from most of these studies are inconclusive.

Thus, this study does not only attempt to redress the imbalance in country studies but also departs from earlier works by examining the relationship between these variables in a multivariate co-integration framework using recent data.

Following the introduction, the study provides research objectives and research hypotheses. This is followed with a brief discussion of macroeconomic trends in Nigeria particularly in the export sector. Section two provides the literature review and theoretical framework, while section three focuses on the research methodology. Section four provides the model results and discussion. The final section contains conclusions and policy implications.

Research objectives and hypothesis

The broad objective of this study is to investigate the relationship and causality between export instability and economic growth in Nigeria. This broad objective can be broken down into the following specific objectives:

(i) Discuss the trends of Nigeria's export sector; and,

(ii) Investigate the impact of export instability on economic growth.

The hypothesis to be tested given the research objectives for this study is that export instability has detrimental effects on Nigeria's economic growth.

Study background

Brief macroeconomic trends in Nigeria: 1970-2011

The pattern and trends of macroeconomic development in Nigeria between 1970 and 2011 are summarized in Table 1. In order to capture the variations in the principal variables and for ease of presentation, this study divides the discussion into four sub-periods in Table 1.

Economic growth was highly unstable during the period under investigation. In Table 1, the first two periods are pre-adjustment while the last two periods are post-adjustment. The first period, 1970 to 1980, is usually referred to as the golden era of economic growth in Nigeria. The impressive economic performance was driven by the oil export boom. The boom provided Nigeria with a huge but unstable source of revenue for investment

and quick economic recovery post civil war.

Table 1: Selected macroeconomic variables in Nigeria, 1970-2011

	1970-80	1981-86	1987-95	1996-11
GDP growth (average annual %)	6.74	-1.87	4.11	4.56
GDP per capita (current US $)	435.40	458.48	258.04	589.62
Agriculture (average annual growth %)	-0.20	1.50	3.40	4.38
Industry (average annual growth %)	8.15	-3.80	2.37	1.88
Manufacturing (average annual growth %)	15.20	7.70	1.60	5.19
Services, etc (average annual growth %)	8.50	-2.80	5.20	8.86
Gross Domestic Investment (annual growth %)	16.35	-0.10	8.79	6.15
Exports of goods and services (% of GDP)	18.77	16.75	37.83	43.21
Imports of goods and services (% of GDP)	17.98	18.72	33.96	32.14
Inflation (consumer prices annual %)	15.57	13.78	40.92	12.99

Sources: World Bank (2012), World Development Indicators (online); Central Bank of Nigeria - Statistical Bulletin Annual Report and Statement of Accounts (Various issues); and International Financial Statistics CD-ROM (2012)

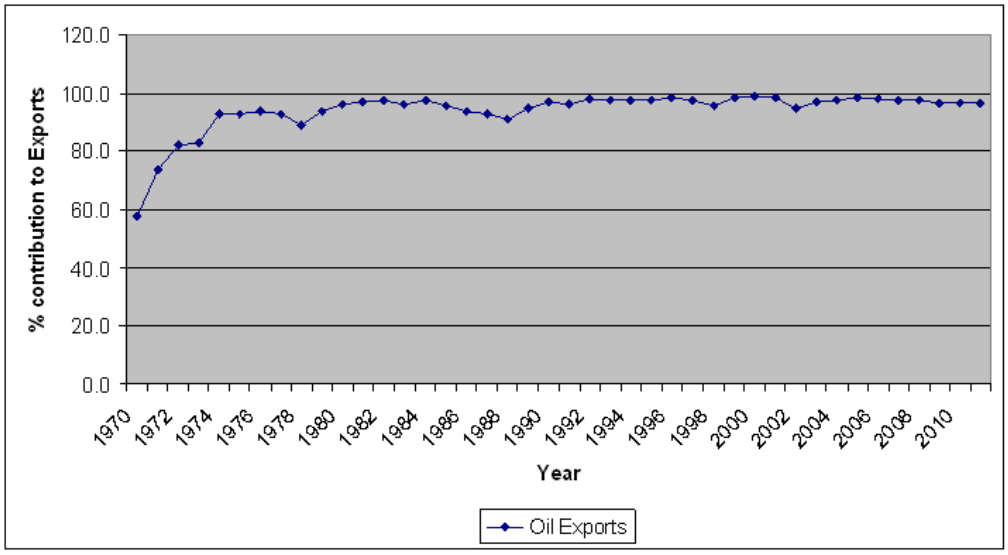
The subsequent lack of sustainability of the impressive economic performance in the second period is illustrated by the negative annual growth rate of real GDP. The erratic economic performance shows the inherent weakness in the dynamics of Nigeria's oil export driven engine of economic growth and its susceptibility to internal and external shocks. An important factor in the erratic macroeconomic performance pertains to unstable trends in real investment expenditure. The high investment rate of 16% achieved during the 1970 to 1980 sub-period was based on booming export income. However, the trend could not be sustained in the second sub-period because of the unstable pattern of oil income flows associated with volatility in the global oil market and unfavorable climatic conditions that affected non-oil exports. A cursory observation of the third and fourth sub-periods show that with the exception of industry, agriculture, manufacturing, services and gross domestic investment experienced very little improvement.

Nigerian export sector

Prior to the oil boom of the 1970s, agriculture was the mainstay of the Nigerian economy. Nigeria's export sector was largely dominated by non-oil products such as cocoa, groundnuts, rubber, cotton, palm produce, and solid minerals (bauxite, columbite, coal, tin ore). The nation's main foreign exchange earnings at that time accrued from the sale of these cash crops.

In the early 1970s, the emergence of crude oil production and exports radically changed the structure of the economy. The oil sector took over as the leading sector of the economy and, over time, the non-oil sector, particularly agricultural production and exports became less competitive. The huge foreign exchange earnings from crude oil exports gave a fillip to massive importation of goods, including food, to the extent that the terms of trade turned against agriculture.

Figure 1: Share of oil and non-oil in total exports, 1970-2011



Oil exports were growing while non-oil exports declined at an alarming rate, making the dominance of oil much more rapid as shown in Figure 1. As depicted in Figure 1, the average contribution of oil to total export stood at 96.8% between 1980 and 2011.

Figure 2 shows that industry was the dominant sector in terms of contribution to GDP until the recent volatility in the oil sub-sector as a result of unstable oil prices, and uprising in the Niger Delta region that continues to affect oil production. The contribution of agriculture increased from 35% in 1998 to 43% in 2003. However, this is still below its 45% contribution to GDP in 1970.

There is no doubt that crude oil production and exports continue to play a dominant role in the Nigerian economy. In fact, as revealed in Figure 3, oil dominated the industry sector, and any development in the oil sub-sector has serious implications for the entire sector, as the contribution of manufacturing has remained stagnant since 1996. As depicted in Figure 1, the share of oil exports in total export remained stable or flat from 2002 to date. However, Figure 3 shows that the contribution of crude oil and natural gas to GDP declined from year 2000 due to price and production volatility in the oil market. Other factors that may account for the decline include improvement in agricultural and services sectors as revealed in Figure 2.

Irrespective of the dominance of oil in total exports (Figure 1), its contribution to total revenue has consistently remained unstable as depicted in Figure 4. Similarly, the non-oil contribution to total revenue is also very unstable, and declined from 70% in 1970 to less than 26% in 2011.

The unstable contribution of oil and non-oil to government revenue may be connected to global commodity price volatility and domestic production bottlenecks. Table 2 presents instability indexes for selected primary commodities that are of interest to Nigeria and other countries in sub-Saharan Africa. The price instability indexes show that price volatility has increased for some commodities of interest to Nigeria and developing countries. For example, the price instability indexes of cocoa, groundnut oil, palm oil, tobacco, rubber and crude petroleum have increased, and in some cases doubled.

Figure 2: Sectoral contribution to Real Gross Domestic Product, 1970-2011

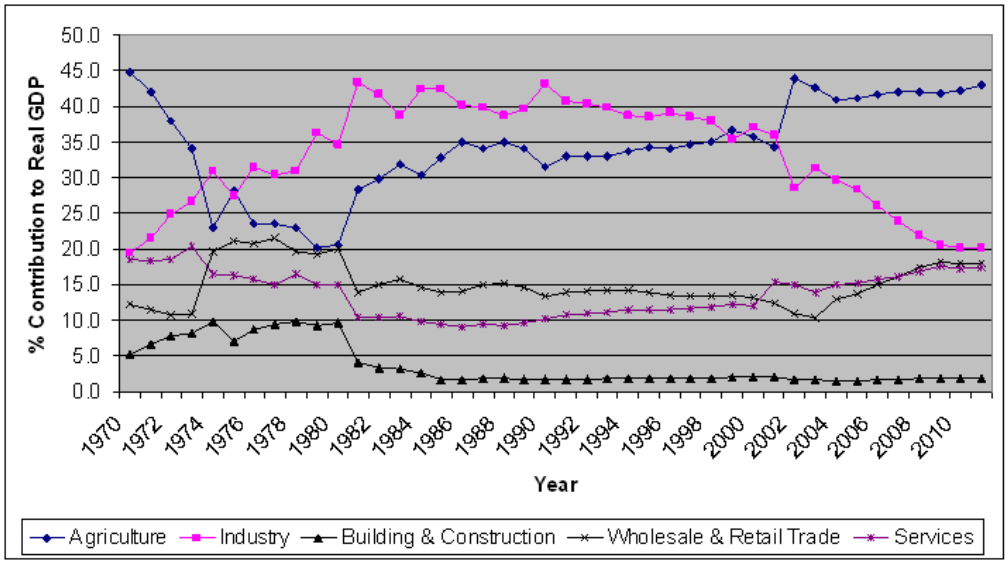
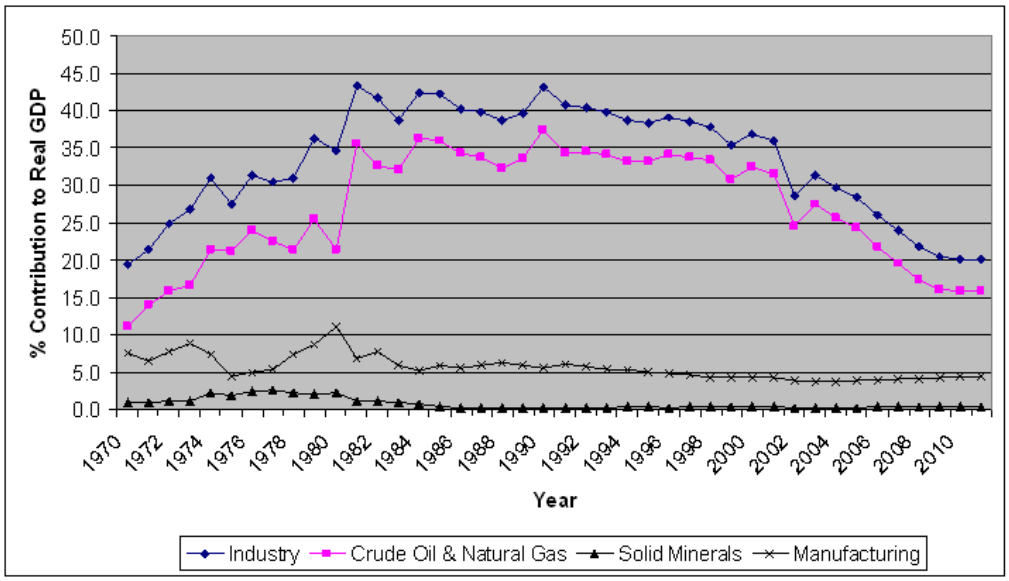


Figure 3: Disaggregated industry sector's contribution to Real Gross Domestic Product, 1970-2011



Also, cyclical income fluctuation in the consuming countries influences commodity prices. Prices fall when restrictive policies are imposed to reduce inflationary pressures in the importing countries. The consequent slowing down of economic growth leads to a decline in demand for raw materials (Adebusuyi, 2004). Also, a flexible exchange rate regime induces more volatility in commodity prices than a fixed regime (Cuddington and Liang, 2003).

Table 2: World commodities price instability indices, 1981-2011

	Products	Period			
		1981- 1990	1991 - 2000	2001-2005	2006-2011
A	**Food**	**16.02**	**10.39**	**4.18**	**18.69**
1	Wheat	11.90	15.45	7.02	21.15
2	Maize	15.69	14.08	8.14	17.48
3	Rice	19.99	13.77	5.32	21.17
4	Soybean meal	14.06	13.65	9.28	16.56
B	**Tropical beverages**	**14.32**	**22.95**	**7.22**	**18.33**
1	Coffee	16.76	30.90	12.14	19.54
2	Cocoa	15.52	17.79	15.29	22.09
3	Tea	17.88	10.69	7.04	10.35
C	**Vegetable oils/seeds**	**17.93**	**16.48**	**9.84**	**22.75**
1	Soybeans	12.52	11.15	10.04	16.56
2	Soybean oil	18.81	18.26	12.48	21.09
3	Sunflower oil	18.59	17.12	7.24	28.59
4	Groundnut oil	27.33	15.23	15.29	28.96
5	Copra	30.33	17.02	10.93	24.92
6	Coconut oil	32.18	17.88	9.91	24.91
7	Palm kernel oil	29.15	18.03	10.07	25.32
8	Palm oil	22.59	23.47	12.23	26.58
9	Cotton oil	15.27	11.22	22.29	28.66
D	**Agricultural raw materials**	**7.18**	**10.07**	**5.44**	**18.36**
1	Linseed oil	23.44	16.85	13.94	23.97
2	Tobacco	6.32	8.88	3.24	14.48
3	Cotton	15.12	17.00	14.19	12.69
4	Hides	9.92	7.94	6.51	19.88
5	Rubber	13.78	27.97	8.60	23.93
E	Minerals, ores and metals	14.42	9.61	9.50	18.51
1	Phosphate rock	12.72	8.66	3.69	68.68
2	Manganese ore	26.79	12.86	13.61	48.99
3	Iron ore	7.21	5.34	14.20	17.21
4	Copper	18.34	14.43	12.04	21.19
5	Nickel	31.62	18.67	12.88	34.94
6	Lead	21.48	15.25	13.86	26.03
7	Zinc	19.68	9.25	12.24	27.28
8	Tin	14.71	6.44	17.44	25.89
9	Gold	10.64	8.23	2.85	5.64
10	Silver	15.07	8.27	6.80	12.35
11	Crude petroleum	16.66	16.02	17.08	32.86

Source: UNCTAD (2012) online database

Figure 4: Oil and non-oil percentage contribution to total revenue, 1970-2011

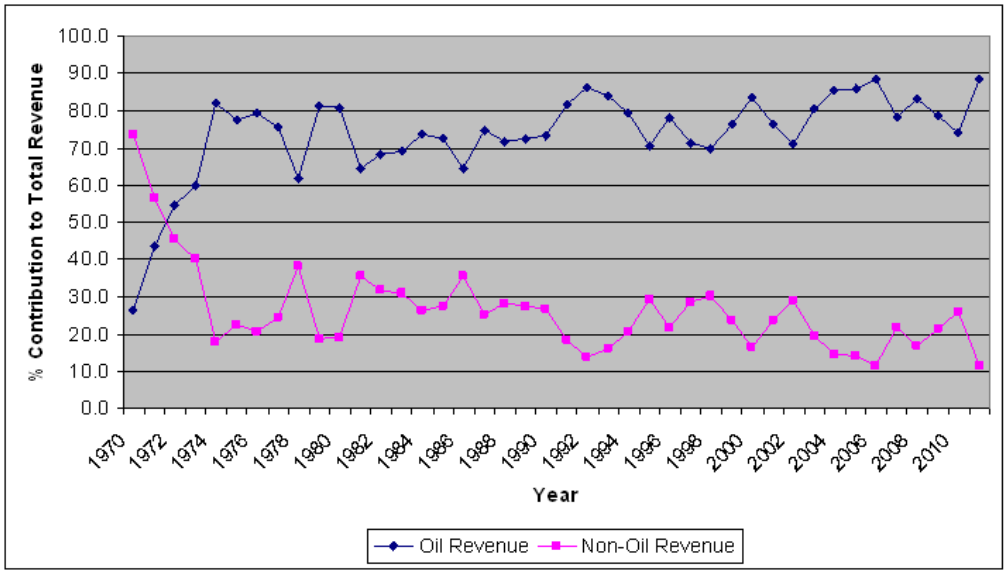
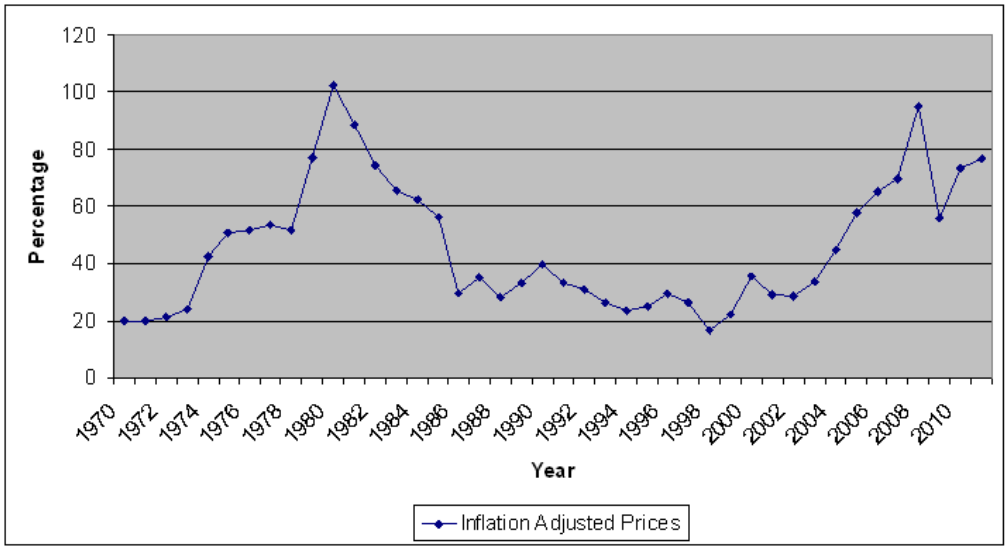


Figure 5: Annual average crude oil prices in the global market, 1970-2011



Over the years, a high degree of price instability, coupled with worsening terms of trade, led to contraction in export earnings, which both directly and indirectly inhibited government programmes in Nigeria. Instability in export earnings restricts economic growth (Fosu, 1992; Aiello, 2000; Collier et al, 2000 ; Combes and Guillaumont, 2002; among others. Also, price shocks and the ensuing export price vulnerability have both microeconomic and macroeconomic impacts on growth and development in Nigeria.

Figure 6: Crude oil exports, 1970-2011

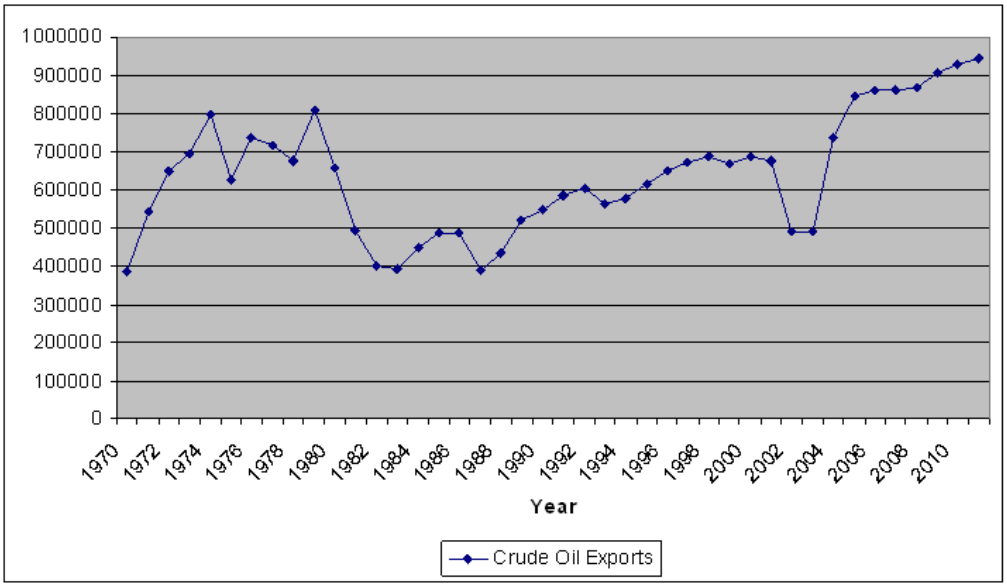
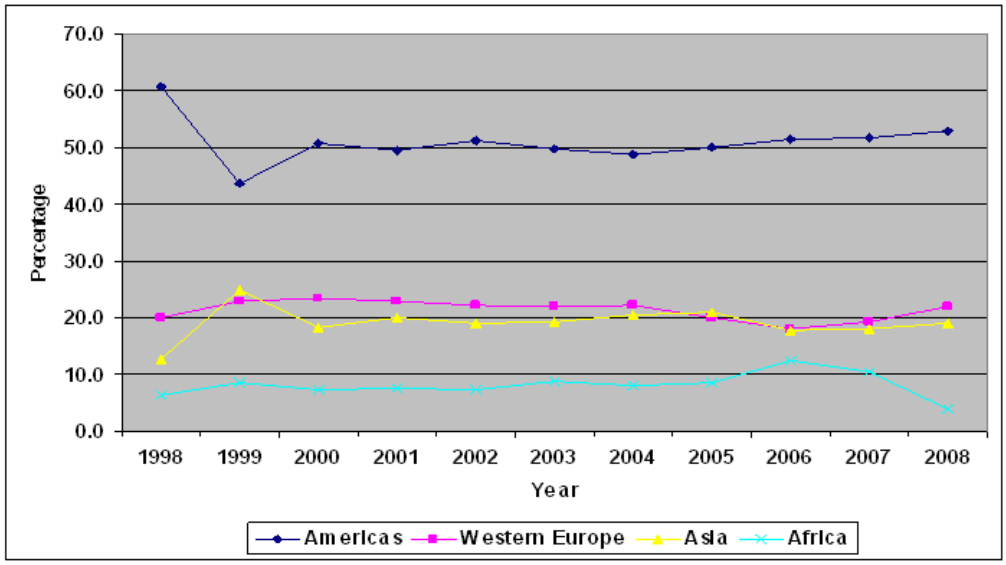


Figure 5 depicts the unstable price of crude oil in the global market. Between 2007 and 2010, the oil sector witnessed unprecedented price volatility, with serious implications for government revenue and development programmes in Nigeria.

Similarly, the volume of crude oil export remains very unstable as depicted in Figure 6. The declining production, which characterized oil output between 1985 and 2005 and between 2007 and 2008, is due largely to militant activities and the attendant destruction of oil production facilities. As depicted in Figure 6, the Federal government's amnesty programme is gradually bringing relative peace to the Niger-Delta area, as crude oil production has surged since 2009.

Irrespective of changes in the export sector, the direction of Nigeria's export has not changed. The Americas still remained the largest buyer of Nigeria's crude oil, followed by Western Europe as shown in Figure 7. The export shares of crude oil to Western Europe and Asia reduced slightly while that of Africa increased between 2004 and 2006. On a country-by-country basis, the United States of America (USA) remained the largest single importer of Nigeria's crude oil, while within Africa, Ivory Coast remained the largest importer of Nigeria's crude oil, followed by Ghana and Senegal.

Figure 7: Direction of crude oil exports (value), 1970-2008



As shown in Table 3, the debt profile of Nigeria is on the increase due to inadequate revenue from oil to finance development programmes. The external debt rose from US$ 3,544.49 billion in 2006 to US$ 4,578.77 billion in 2010 and US$ 5,666.58 billion in 2011. The growth of domestic debt (column 4) may also lead to an increase in inflation, which in 2011 was 15.66%.

Table 3: Nominal exchange rate, national debt, inflation, external reserve and investment in Nigeria, 2000-2011

Year	Nominal	National Debt		External	Inflation	Investment
	Exchange rate (N per US $)	External (US $ billion)	Domestic (US $ billion)	Reserves (US $ million)	Rate	/GDP
2000	109.8	28,273.68	8,180.78	10,667	14.53	7.22
2001	112.7	28,347.00	9,023.69	10,556	16.49	7.87
2002	126.5	30,991.87	9,217.39	8,378	12.14	7.23
2003	136.3	32,916.81	10,283.99	8,234	23.84	10.20
2004	132.7	35,944.66	10,314.79	18,566	10.01	7.56
2005	130.6	20,477.97	11,828.76	29,023	11.57	5.52
2006	128.9	3,544.49	13,805.20	43,664	8.57	8.33
2007	132.8	3,654.21	18,575.67	51,330	6.56	9.27
2008	136.4	3,720.36	19,660.62	53,000	15.10	8.35
2009	148.9	3,947.30	22,659.55	42,382	12.54	9.41
2010	150.6	4,578.77	29,887.49	32,339	14.02	9.66
2011	158.2	5,666.58	33,435.06	32,639	15.66	9.87

Sources: www.dmo.gov.ng/documents/debtprofile/external, CBN, Statistical Bulletin (various issues)

The debt service on external debt has been on the increase. Over the years, the value for this indicator has fluctuated between US$ 549 million in 2009 and US$ 94 million in 1971. This has serious implications for domestic growth, as these resources form part of the withdrawal from the circular flow of income.

In order to mitigate the effect of export earnings instability on the Nigerian economy, the excess crude account (ECA) was created in 2003. The objective of the ECA is to achieve macroeconomic stability by controlling money supply and ensuring that excess revenue is kept aside for lean years. At its peak in 2007, the account stood at about US$20 billion while foreign reserves were above US$50 billion (Table 3) following huge accruals to government. That changed at the end of 2008, when the economic crisis reverberated around the globe. Nigeria was not spared. In less than three years, more than US$15 billion had been disbursed from the fund without any commensurate impact on the quality of life of the citizens. In 2011, the government discontinued the ECA and created a national sovereign wealth fund (NSWF).

Typically, a national sovereign wealth fund is created when governments have budgetary surpluses but little or no international debt. This excess liquidity is not always possible or desirable to hold as money or to channel into immediate consumption. This is especially the case when a country such as Nigeria depends on raw material exports such as oil and gas, copper or diamonds. In such countries, the main reason for creating an NSWF is because of the characteristics of resource revenue: high volatility of resource prices, unpredictability of extraction, and exhaustibility of resources.

The NSWF is meant to act as an investment fund to promote the achievement of multiple economic objectives for Nigeria. This is in turn expected to serve as an economic transformation mechanism impacting positively either directly or indirectly on most of the nation's citizenry. From the moment crude oil was discovered sometime in 1956 in a community called Oloibiri in Nigeria, adequate measures should have been put in place to ensure that the nation was not unduly exposed to the resource curse syndrome.

On one hand, the NSWF is a long-term investment vehicle looking beyond quarterly results and, therefore, serves as a stable funding source during financial turbulence. On the other hand, there are operational concerns stemming from government control (that is lack of transparency and possible non-commercial investment goals). According to many political commentators, without transparency it is difficult to attain a clear picture of NSWF investment activity. They argue that lack of NSWF transparency can also obscure government intentions and risk management problems within the fund.

Some of the expected benefits of the NSWF in Nigeria include: (1) economic competitiveness as the Nigerian economy will certainly become more attractive for foreign direct investments (FDI). The high level of seriousness which the establishment of the NSWF signals will be a good yardstick for measuring government's commitment to the global standards of transparency and accountability in the management of natural resources; (2) prudence in resource management as the culture of unrestricted spending of unanticipated income will be curtailed. Investments will be based on sound, clear and beneficial economic parameters; (3) the availability of a pool of savings or back-up funds for future generations; (4) the availability of a counter-cyclical economic stabilization fund as this will assist in smoothening income variations over time.

From our analysis, we can infer that there is also opportunity cost associated with export instability in Nigeria and other developing countries, as these countries may need

to hold high foreign exchange reserves to act as buffers during export slumps.

This paper argues that export instability might be one of the causes of inflation, which often results from high wages and income in the export sector during boom periods. As is often the case during the boom period, there will be an upward movement of wages and prices, which, owing to "downward stickiness", will not fall when the boom dissipates.

In general, government revenue in Nigeria depends heavily on oil exports and a narrow basket of primary commodities. Under the Structural Adjustment Programme (SAP), the government made attempts at reviving the non-oil export sector by putting in place a mix of export promotion measures aimed at reversing the sector's adverse terms of trade. These measures notwithstanding, the performance of the non-oil export sector is still below expectations, as crude oil continues to dominate Nigeria's export scene. As discussed, the prices of primary commodities are still relatively volatile. In Nigeria, two major types of factors are at the root of the unstable macroeconomic development: external factors connected with development in the oil and non-oil sectors, and internal factors associated with macroeconomic management and overall public policy reactions.

Proximate consequences of export instability on Nigeria's economy

Nigeria's vulnerability to export instability depends on the relative magnitude and the interaction of three main factors. These are: the size of price instability; the degree of the country's openness and the capacity of the economy to react; and the ability of the policy makers to manage instability.

As expected, export instability has implications for terms of trade. A decline in Nigeria's terms of trade as a result of vulnerability in the prices of primary products would lead to contraction of GDP and investment. High export instability also has implications for domestic savings and would favour investment that would yield short-term returns. On the other hand, low export instability would likely favour investment in productive assets. In general, export instability often exacerbates uncertainty in the business climate, which might lead to capital flight and would also create variability in imports of capital and intermediate goods needed for development purposes (Adebusuyi, 2004).

As articulated by Guillaumont et al (2003), unstable international prices often lead to instability in export earnings, with serious implications for real exchange rate. . As witnessed in Nigeria in the 1970s and early 1980s, increase in export earnings during the boom period resulted in Naira appreciation and loss of competitiveness of tradable goods sectors, a phenomenon referred to as "Dutch Disease". In countries with a fixed exchange rate regime, a shortfall in export earnings is usually unlikely by itself to generate real exchange rate depreciation that would improve competitiveness.

In general, according to UNCTAD (2001) report , if prices for the 10 most important agricultural commodities exported by developing countries had risen in line with inflation since 1980, the exporters would have received around US$112 billion more in 2002 than they actually did. As pointed out, this is more than twice the total amount of aid distributed worldwide. Thus, export instability creates fiscal imbalances as government expenditure often outweighs the revenue generated, leading to current account and balance of payment deficits. The recurrent payment incidents in some SSA countries are easily explained by

the size of the shocks as compared to budgetary resources. High export instability may also constrain the capacity of developing countries to plan (MacBean, 1966).

As is often the case in many developing countries, export instability and related relative price instability continue to lead to political instability (Guillaumont et al, 2003). Extending the debate, Collier and Hoeffler (2001) emphasized that export instability may be an important explanation for the relation found between the share of primary commodities in exports and the risk of conflicts in developing countries.

2. Review of selected literature and theoretical framework

Literature review

Since the adoption of the IMF/World Bank adjustment programme in the early 1970s and 1980s, the exports sub-sector has been very unstable in many developing countries, especially in sub-Saharan Africa. As a result, the debate is gradually shifting from the relationship between export and growth to the impact of export earning instability on economic growth. For our purpose, it is important to distinguish between instability and volatility. Instability refers to year to year fluctuations in exports. Mathematically, it is often defined as the difference between the actual and estimated value of exports. Further, export instability refers to uncertainty about the export earnings accruing to a country. On the other hand, volatility often refers to rate of change in price over a given period of time. Expressed often as a percentage, it is computed as the annualized standard deviation of the percentage change in the daily price.

Some approaches have been used to analyse the effects of export instability on economic growth. The most popular is the cross-country regression analysis, which attempts to aggregate the experience of large samples of countries over a given period. Pioneering studies by Coppock (1962) and MacBean (1966), argued that there is no statistical evidence to support the hypothesis that fluctuations in export proceeds inflict any significant damage on the stability and growth of the average underdeveloped country, or that there is "any relationship between growth in per capita real income and export instability". Coppock (1962) considered as evidence the absence of correlation between his export instability index and the rate of growth of GNP or the percentage increase in per capita GNP for all countries considered. Also, MacBean's (1966) conclusion that there are no significant effects of export instability on economic growth is based on the following evidence: lack of association between the instability index of exports and that of national income for 35 developing countries using Coppock's (1962) data; and the lack of significant regression coefficients in the multiple regression analysis between the growth rate of the GDP and the export instability index, the growth rate of import capacity, and the ratio of foreign trade to national income.

Although these studies contributed immensely to the discussion on the impact of export instability on growth, they suffer from methodological drawbacks that distort the true relationship they seek to estimate. First, Coppock's (1962) instability index, which is merely the antilogarithm of the log variance of the yearly rates of change of the time series, is greatly influenced by the choice of the first and the last year of the series. Thus, this measure, especially when it is used for a short range time series is an almost

random estimate of instability. Second, for the income growth, Coppock (1962) used the percentage increase in GNP per year, adjusted for price changes, while MacBean (1966) used the compound annual rate of growth of GDP in current prices. Since developing countries have higher population growth rates than developed countries, the use of total GNP or GDP growth rates rather than the respective per capita growth rates introduced an upward bias into the rates of developing countries. Further, since the rate of inflation in developing countries is often higher than in the developed countries, the use of income data in current prices for the estimation of the income growth rates results in an additional over-estimation of the growth rates for the developing countries.

Glezakos (1973) criticized the results of both Coppock (1962) and MacBean (1966) on the basis of methodological errors. He used a different instability index, which is the arithmetic mean of the absolute values of the yearly changes in a time series corrected for trend and expressed as a percentage of all observations. The results of his regression analysis show that export instability has a significantly negative effect on real per capita income growth, and that export instability is highly detrimental to economic growth in developing countries, including Nigeria.

In the same vein, a study by Moran (1983) used cross-section data for 30 countries (18 of them in Latin America) to study the relationship between export fluctuations and economic growth. Data used were for a single year, 1974-75. Using several measures of export instability, he found that the results were very sensitive to the period under consideration, and that no general inference could be drawn.

Voivodas (1974) regressed GDP growth rates on an export instability index using cross-section data and obtained a negative correlation between export instability and economic growth. Ozler and Harrigan (1988) used an instability index that varies over time-regressed GDP growth rate on an export instability index. Their findings show a negative association between export instability and economic growth. This study argues that the results above are sensitive to the particular time period considered, thus the negative impact can be expected when price and quantity instability appear to reinforce each other.

Lam (1980) used the standard error of estimate of the mean in calculating his export instability index and correlated it with export and GDP growth. He concluded that there exists a positive and significant association between export instability and export growth; between export growth and geographical concentration; and hence, between export fluctuations and market concentration, but not in any direct causal manner. This result was found using cross-sectional data of 14 Western pacific countries covering the periods 1961-1972 and 1961-1974.

However, Tan (1983) and Glezakos (1983) criticized Lam's (1980) results for having a systematic bias in the manner in which the instability index was calculated. Tan corrected the error in Lam's instability index by fitting curvilinear trends to the export values of all the countries in Lam's sample using the same data source and covering the same time period. He confirmed no statistically significant correlation between export instability and export expansion or domestic income expansion. Glezakos employed both linear and exponential trend lines covering the period 1961-1972, as well as for 1961-1974 using 14 Western pacific countries. He found that export instability affects export growth, but concluded that there is tautology in Lam's findings.

In their study of 34 sub-Saharan African countries, Gyimah-Brempong (1991) used average data between 1960 and 1986 and neoclassical growth equations to investigate the interaction between export instability and economic growth. They used three different measurements of export instability: the coefficient of variation of export earnings; the mean of the absolute difference between actual export earnings and its trend value, normalized around the trend value of export earnings; and the average of the squares of the ratio of actual export earnings to trend earnings. The results from the three measurements of export instability show that export instability has a negative and significant effect on economic growth. Love (1992) used time -series data for 20 trade-dependent countries, employed the Granger (1969) and Sims (1972) reduced-form approach, and showed that export instability induces short-run macroeconomic instability.

In an attempt to avoid measurement and methodological issues, recent studies used the country-study approach. The study by Sinha (1999) is one of the first time series econometric exercises that examined the relationship between export instability, investment and economic growth. The variables included in his estimation were real GDP (a measure of output), real exports, deviation of export from its five year moving average (used as the measure of export instability), investment (proxy by gross fixed capital formation), and labour (proxy by population). He found a negative relationship between export instability and economic growth for Japan, Malaysia, Philippines and Sri Lanka and established a positive relationship for South Korea, Myanmar, Pakistan and Thailand. In the case of India, the results were mixed. In another study, Sinha (2007) examined the effects of volatility of exports in the Philippines and Thailand. He used quarterly time series data (1960:1–2004:4), and the GARCH model. Sinha found that shock to volatility of growth of exports is permanent, and that past volatility is significant in predicting future volatility.

Ghirmaya et al (1999) found that export and income terms of trade instability have long run relationships with output. For most countries in their sample, instability in the income terms of trade is negatively related to output, while the results for export instability are mixed. With respect to causality, it seems that export instability and income terms of trade instability play a causal role in the development process. Wasim (2003) examined economic growth and instability in Pakistan's exports value by economic classification using time -series data for the period between 1973 and 2001. For ease of discussion and to clearly bring out the trend in a more recent period, Wasim divided the period into two sub-periods, namely, period I (1973 to 1987) and period II (1988 to 2001). The study found that during the entire period (1973 to 2001), the growth rate of manufactured goods was highest, followed by semi-manufactured and primary commodities. Further, his finding showed that export instability is higher for semi-manufactured and primary commodities than for manufactured goods; and the study confirmed that there exists a statistically significant and positive association between export growth and export instability in Pakistan.

Using annual data between 1975 and 1998, Devkota (2004) examined the causes of export instability in Nepal. He used two methods in measuring the export instability index: the deviations of actual value from the trend values obtained from a five-year moving average, and the deviations between the observed and estimated values obtained by fitting the linear and exponential trend lines with the help of ordinary least square (OLS)

method. He concluded that there is a positive relationship between the instability index of exports and the independent variables, i.e., the higher the commodity and geographic concentration of exportable commodities, the higher the instability of exports.

In the same vein, Borumand, Bigdeli and Rezaei (2009) examined the relationship among export instability, capital accumulation and economic growth in Iran. They used time series data (1971-2004), the autoregressive conditional heteroscedasticity (ARCH) model to measure export instability, and the neoclassical growth model to estimate the relationship between export instability and economic growth. They confirmed that in the long run, export instability has a negative effect on investment and economic growth, while the short run effect was minimal.

Kaushik, Arbenser, and Klein (2008) used Johansen's co-integration technique and a vector error-correction model (ECM) to investigate the relationship between economic growth, export growth, export instability and gross fixed capital formation (investment) in India during the period 1971- 2005. The variables used in their study are real GDP, real export of goods and services, square of log of exports minus estimated log of exports (used as a measure of export instability), and investment (proxy by gross fixed capital formation). Their empirical results suggest that there exists a unique long-run relationship among these variables, and the Granger causal flow is unidirectional from real exports to real GDP. For instance, ceteris paribus, a 1% increase in exports raises GDP by an estimated 0.42% in the long run. The short term dynamic behavior of the income growth function was investigated by estimating an error correction model in which the error correction term was found to be correctly signed and statistically significant.

The study by Bilquees and Mukhtar (2011) explored the causal relationship among export instability, income terms of trade instability and economic growth in India using cointegration tests and vector error correction model (ECM) for the period 1960 to 2008. The variables included in their estimation are GDP (as a measure of economic growth), investment (proxy by gross fixed capital formation), and exports (measured by real exports). They found that there exists a long run equilibrium relationship among export instability, income terms of trade instability and economic growth. Both in the short and long run, the Granger causal tests show a unidirectional relationship from export instability and income terms of trade instability to economic growth and investment. Also, the study by Bakar and Subramaniam (2010) examined the relationship between export instability and economic growth in Malaysia using time series analysis techniques that address the problem of non-stationarity. Findings from this study showed that in Malaysia's case, all variables involved are non-stationary in levels but stationary in first differences and are cointegrated. They found that export instability has a deleterious effect on Malaysia's economic growth. They concluded that instability in export earnings can cause economic reprisals, which will affect the economic performance of the country.

Using panel data between 1990 and 2006, Gholamreza, Farshid and Ali (2010) investigated the effect of investment and export instability on economic growth in 22 East Asia and Pacific countries. Applying the panel random effect model, their results show a negative relationship between export instability and economic growth. From their investigation, the coefficient of export is 0.5, which implies that export has a greater effect on growth than other factors.

In general, many of these previous studies focused on developed and developing countries in Asia and Latin America. The results from the various cross sectional studies and few country studies cannot be generalized. Thus, there is a need for country-specific studies on the subject matter to shed more light on the debate and allow for more country-specific policies. For Nigeria, the important question at this point is that given the ongoing economic reforms and continuous swings in the global exports market, what is the relationship between export instability and economic growth? What steps can the Nigerian government take to minimize the impact of export earning instability on development programmes? This study intends to break new ground by investigating along this direction.

Theoretical framework

It is well acknowledged that sudden inflow of large foreign exchange into an economy may turn into a mixed blessing for its economic development prospects. This is often true when the inflow is determined by the sudden development of a natural resource sector (discovery of large reserves – see Gelb, 1998) or due to other factors such as aid inflows (IMF 2005; and Foster and Killick, 2006). In fact, such external shocks are expected to have substantial short and long run impacts on the economy.

Therefore, in this section, the study explores recent developments in economic theory on export earning instability. In the short run, the literature stressed the link between instability in primary exports earnings and competitiveness, while in the long run, the instability in primary export earnings is expected to influence economic growth.

Dutch disease: Short term effects

The theory of "Dutch Disease" was originally designed to explain the relation between natural resources and poor economic performance of the Netherlands with the discovery of gas in the 1970s. The term is often used to explain the relationship between a large inflow of foreign capital and an appreciation of a country's real exchange rate. In other words, the boom and subsequent surge in resource exports cause an appreciation of the real exchange rate through the appreciation of the nominal exchange rate and/or a rise in the domestic price level, which decreases the competitiveness of the country's other non-resources tradable goods.

Corden and Neary (1982) and Corden (1984) developed the theoretical model for Dutch Disease in an attempt to show the adverse effects a large inflow of foreign currency can have. The model describes a small open economy divided into three sectors. The first two sectors produce two goods that are traded internationally, at exogenously determined prices. One export sector is booming and the other is lagging. The booming sector usually consists of natural resources; i.e. agriculture or mining sector (oil and gas in the Nigerian case). The lagging export sector includes other tradable manufactured goods. The third sector produces a non-traded good that supplies domestic residents, such as retail trade, services and construction. Here, the prices are flexible and determined by domestic supply and demand. There also exists two production factors (labour and

capital). Labour can move from one sector to another while capital is sector-specific. Other assumptions are the full employment of production factors, the perfect price flexibility, and constant returns to scale.

The Dutch Disease summarizes two types of effects: the spending effect and the resource movement effect. For the spending effect, it is expected that a boom in a country's export sector would result in a large inflow of foreign currency, leading to an increase in national income and consequently increases in spending and demand for both non-tradable and tradable goods. The prices of non-tradable goods are determined by domestic supply and demand. Therefore, when there is an increase in demand, it is followed by an increase in the price of non-tradable goods. Since the prices of tradable goods are exogenously fixed in the world market, and we assume a small economy, an increase in domestic demand would not affect the price of tradables. The increase in the price of non-tradable goods leads to an appreciation of the real exchange rate, weakens the competitiveness of the country's tradable goods sector, and thus causes that sector to contract.

With the resource movement effect, there is an increase in the wages of the booming sector due to an increase in marginal productivity, leading to labour movement from the lagging export sector and the sector with non-tradable goods to the booming sector. This movement will continue until the equalization of wages in all sectors. Reduced supply in the non-tradable sector results in excess demand, which is followed by an increase in prices and, thus, increase in wages. Until wages are equalized, there will be movement of labour to the non-tradable sector from the lagging sector.

Neoclassical model: Long term effects

Since instability of earnings from exports generates risk, it would modify the aggregate reaction of agents and hence has an influence on economic growth. Kemp and Liviatan (1973) and Eaton (1979) provided a static underpinning on the instantaneous effects of risk on factors allocation. However, the dynamic approach by Brock (1991) appears better suited to the analysis of the effects of instability on economic growth. The dynamic framework developed by Brock relied on several hypotheses: an infinite representative agent and a neoclassical technology (constant returns to scale, factors substitutability, exogenous labour supply, etc.). The main characteristic of the model consists in a random production activity because of exogenous random shocks. The income drawn from production activities finances imports of consumption and investment goods, and the accumulation of foreign capital riskless assets. The representative agent is risk-averse in the sense that he tries to get rid of it (Arrow, 1971) and prudent as risk modifies its optimal behaviour when confronted with a mean preserving increase in the exogenous risk (Kimball, 1991).

The effect of risk on savings is different, as the risk is a labour (capital) income risk. The effects of labour income risks on savings are non-ambiguous especially when labour supply is exogenous: the prudent agent increases its savings when confronted with increased risk. This behaviour is interpreted as a self insurance against the effects of risk in so far as it is used as a buffer stock when the income is cut off. The effects of capital income risks on savings are ambiguous. The effect is different as a unit of capital

may disappear . Thus, an increase can have two opposite effects: a positive income and a negative substitution effect. The income effect corresponds to the agent's behaviour that increases its saving when the risk increases, while the substitution effect describes the response of the agent that reduces its own exposure to risk. For a prudent agent, the income effect outweighs the substitution effect, thus resulting in increased savings. . For our purpose, we assume that poor agents are prudent, as the consequences of an increased risk may endanger their own existences.

The model as developed by Brock (1991) is based on the tenet of a perfect capital market. A perfect capital market hypothesis might not be relevant to developing countries, but the existence of liquidity constraints as developed by Deaton (1991) is relevant. Therefore, current consumption is not determined by permanent income but depends on current income. Thus, liquidity constraints increase precautionary savings in so far as rationed credit supply have disastrous effects on welfare. Savings can either be used for financing domestic investments, or the purchase of non-risky foreign assets. Thus, savings and investments in an open economy may have different evolutions.

Simple portfolio analysis shows that an increase in risk discourages the risk-averse agents from investing. As succinctly described by Dixit (1994), the latter negative effect of risk on domestic investments is reinforced when investment decisions are irreversible (sunk costs). This negative effect of risk on the amount of investments can be counterbalanced by a positive effect of risk investments returns. The portfolio analyses justify the positive link between growth and risk: the agents have the opportunity to choose between risky but high return investments versus less risky but low return investments.

The steady state growth is exogenous as it depends on population growth and technical progress. Therefore, risk does not influence asymptotic economic growth rate. According to Barro and Sala-i-Martin (1996), risk only affects the transitionary (or non-steady state) economic growth. Recent developments allow for the endogenization of technical progress and labour supply. In the latter case, risk may modify the steady state growth. At the other spectrum, a lower investment rate may irreversibly reduce the technical progress under the hypothesis that technical progress is proportional to the amount of factors. In general, risk has a negative influence on the steady state per capita, thus reducing the steady state income per capita and welfare.

3. Research methodology

Early empirical studies examined the relationship between export instability and economic growth using cross-section methodology. Also, many of these studies focused on Asia and Latin American countries.

This study redresses the imbalance in the literature, uses a relatively large data sample size, and recent econometric techniques to investigate the nature of the relationship between export instability and economic growth in Nigeria using Johansen's maximum likelihood co-integration approach.

As pointed out earlier, a major drawback of the cross-section analysis is that it holds the instability index constant over time. Inspection of export receipts data, however, indicates that export receipts are stable in some periods and very volatile in other periods. As a departure from existing studies, we use an instability index that varies over time.

Model specification

In order to analyse the impact of export instability on economic growth, we first investigate the effect of instability on growth over time using the modified neoclassical growth equation. Second, in examining the effect of export instability on investment, the study estimates an investment equation with instability as an explanatory variable. The empirical specifications of the equations are discussed below.

Instability and growth

There are two possible channels through which export instability can affect economic growth; through its effect on output, and the levels of investment. Export instability can directly affect economic growth by creating distortions, thus creating losses in output, and can directly affect output by affecting the level of investment, and hence capital accumulation. Accordingly, the growth equations and investment equations are estimated.

This study assumes a Cobb Douglas form of neoclassical growth model, which is interpreted as the null hypothesis. Therefore, we are interested in testing whether instability improves the explanatory power to this growth model. Thus, we have:

$$\ln Q_t = b_1 + b_2 \ln INV_t + b_3 \ln X_t + b_4 \ln LAB + \gamma EI_t + v_t \qquad (1)$$

where Q is real aggregate output proxy by real GDP, and LAB is the labour input, representing the labour force, while INV represents investment, proxy by gross fixed capital formation [investment is measured in real units using the GDP deflator provided by the National Bureau of Statistics (NBS)], X is export the variable measured by real export earnings, obtained by adjusting the nominal export values by an export price index provided by the Central Bank of Nigeria (CBN), EI_t represent the export instability index and V_t white noise error.

We specified the investment equation as:

$$INV_t = a_0 + a_1 INV_{t-1} + \zeta EI_t + \varepsilon_t \tag{2}$$

Index of export instability

As discussed in the literature review, a number of statistics have been used to measure fluctuations in export earnings. Naya (1973) used the least square method, which involves fitting a function of time to export earnings while Tegegne (1991) used the log variance method, which closely approximates the average year to year percentage variations in earnings from exports of goods and services adjusted for a constant percentage trend. The shortcoming of this approach is that the index is highly sensitive to the particular period chosen by the research; moreover the complexity of the method constitutes an inherent flaw. Following Love (1992), Sinha (1999), Kaushik, Arbenser and Klein (2008), Akpokodje (2000), and Bilquees and Mukhtar (2011), this paper uses standard normalization combined with a moving average approach. It involves finding a moving norm or trend that yields deviations from a trend that appropriately balances over a short period of time. Fluctuation in export earnings (F) was derived by applying the following formula:

$$F_t = \frac{X_t - X4_j}{\sigma 4_j} \qquad \text{with} \qquad X4_j = \frac{1}{4}\sum_{j=t-3}^{t} X_j \tag{3}$$

where X is the export earnings and σ 4 is the standard deviation of the export earnings of a four-year period. The advantage of this method is that it distinguishes between rise and fall, temporary and permanent, and stochastic and predictable changes, all relative to the most recent experience in the indices obtained.

Sources of data

The study uses time series data from 1970q1 to 2011q4. Thus, we have 168 observations. The sample is relatively large when compared with sample size in previous studies in this area of research, especially for small open economies. The data on GDP, gross fixed capital

formation and export were obtained from International Financial Statistics, a publication of the International Monetary Fund and World Tables of the World Bank for consistency reasons. The data compare favourably with those collected from the National Bureau of Statistics (NBS) and Statistical Bulletin, a publication of the Central Bank of Nigeria.

All variables are in real terms and possible seasonality in the data series is addressed by including seasonal dummies in the estimated models.

Estimation procedure

Since macroeconomic time series data are usually non- stationary (Nelson and Plosser, 1982) and thus conducive to spurious regression, we first test all the variables for stationarity. There are several ways of testing for the presence of a unit root. Notable early studies include Dickey and Fuller (1979), Nelson and Plosser (1982), Said and Dickey (1984), but notable alternative approaches are suggested by Dickey and Fuller (1981), Phillips (1987), and Phillips and Perron (1988). The Augmented Dickey-Fuller (ADF) tests equation below is estimated for each of the time series:

$$\Delta y_t = \alpha_0 + \rho y_{t-1} + \sum_{i-1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t, \quad \left[\varepsilon_t \sim IID\left(0, \sigma^2\right)\right] \tag{4}$$

where Δ is the difference operator, k denotes the number of lags, ε is the error term, βs are parameters. The null hypothesis to be tested as earlier stated is:

$H_0 : \rho = 0$ against the alternative hypothesis that $H_1 : \rho < 0$,

The test is sensitive to the choice of the lag length and the lag length, i.e. the order of auto-regression, has significant power and size implications.

The unit root tests suggested by Phillips and Perron (1988) have two main advantages over the corresponding ADF test. First, in contrast to the ADF test, which includes more explanatory variables to deal with the autocorrelated residuals and reduces the effective number of observations, i.e. the degrees of freedom, the Phillips and Perron test overcomes the problem of autocorrelation by using non-parametric correction. Second, the Phillips and Perron test is valid under more general assumptions about the sequence of innovations, hence, allowing for all finite ARMA processes. The study uses both ADF and PP tests to investigate stationarity.

Johansen maximum likelihood approach to co-integration

The starting point of this analysis (general analysis) is the following VAR (k) specification for the $p \times 1$ vector of variables integrated of order one, X_t.

$$X_t = A_1 X_{t-1} + \ldots\ldots + A_k X_{t-k} + c + \psi D_t + \varepsilon_t \quad t = 1 \ldots T \tag{5}$$

where c is a $p \times 1$ vector of constants terms, D is a $p \times 1$ vector of dummy variables, and $\varepsilon_1, \ldots\ldots, \varepsilon_T$ are *i.id.* $N_p(0,\Sigma)$. The Johansen procedure entails setting out a model in error correction form, where is the difference operator:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{k-1} \Delta X_{t-k-1} + \Pi X_{t-k} + c + \Psi D_t + \varepsilon_t, \; t = 1, \ldots, T. \tag{6}$$

where,

$$\Gamma_i = -\left(I - A_1 \ldots A_i\right), \quad i = 1, \ldots, k-1,$$

$$\Pi = -\left(I - A_1 \ldots\ldots A_k\right)$$

and where k is the lag length. Given our assumptions, if the data are integrated of order one, i.e. $I(1)$, then the matrix Π has to be of reduced rank, r. On the other hand, if Π is of full rank, this implies that all variables are $I(0)$. Also, if Π has zero rank, the term ΠX_{t-1} drops out of the equation and the variables in question are not co-integrated, where $0 <$ rank of $\Pi < P$, there is at least one co-integration vector. Thus, we have: $\Pi = \alpha\beta$.

where α and β are $p \times r$ matrices and $r < p$. Therefore, $\beta' X_t$ represents the linear combinations of non-stationary variables, which are stationary and α is the matrix of adjustment coefficients. Further, according to the Granger representation theorem, when a vector comprising n $I(1)$ variables, X_t are co-integrated with a co-integrating vector α, there exists an equilibrium-correction representation:

$$A(L)\,\Delta X_t = -\gamma\alpha\, X_{t-1} + \beta(L)\varepsilon_t \tag{7}$$

where $A(L)$ is matrix polynomial in the lag operator L with $A(0) = I_n$, γ is a non-null vector of constants, $\beta(L)$ is a scalar polynomial in L and ε_t is a vector of white noise errors. Therefore, in the short run, deviation from the long run equilibrium $\left(\alpha' X = 0\right)$ will impact on changes in X_t and lead to movement back to equilibrium. According to Agenor and Taylor (1993), if some element of the vector X is being driven by the equilibrium error, so that the relevant element of γ is non-zero, such a feedback response exists. Though, if the nth element of γ is zero, the n^{th} element responds only to short term shocks to the stochastic environment.

The inclusion of equilibrium-error correction terms allows for adjustments of changes in variables in the vector X to their long run equilibrium values to be identified, providing information on the speed of adjustment to disequilibrium errors. When the

equilibrium–correction term has a statistically significant coefficient and displays the appropriate negative sign, the hypothesis of an equilibrium relationship between the variables in the co-integration equation is valid. Of course, any attempt to fail to take account of co-integration between the variables would lead to mis-specification in the dynamic structure underlying our model. The equilibrium-error term generated from the Johansen co-integration procedures is included as an additional regressor to avoid the loss of potentially relevant information.

4. Model results and exposition

Descriptive statistics and informal chart-based analysis

As a first step in this analysis, the plots of the series are presented in Appendix 1 while the basic characteristics of the distribution of the variables are presented in Table 4. The series are normally distributed, including the export instability index. The most striking feature to emerge is the similarity among the variables.

Table 4: Summary of the descriptive statistics of the variables

	LQ	LX	LAB	LINV	EI
Mean	10.56825	5.997678	11.08626	11.13723	0.542580
Median	11.18335	6.525606	11.29719	11.16167	0.814582
Maximum	12.35800	8.895426	13.27404	13.23344	5.177742
Minimum	6.935391	1.779190	7.621563	9.115425	4.281102
Std. Deviation	1.569359	1.769387	1.365959	1.327755	2.944231
Skewness	-1.006156	-0.841448	-0.582619	-0.024983	-0.059143
Kurtosis	2.751800	2.832056	2.688045	1.504475	1.575782
Jarque-Bera	28.77703	20.02241	10.18568	15.67364	14.29671
Probability	0.000001	0.000045	0.006141	0.000395	0.000786
Sum	1775.466	1007.610	1862.492	1871.055	91.15352
Sum Sq. Dev.	411.3021	522.8318	311.5960	294.4099	1447.639
Observations	168	168	168	168	168

LQ = real GDP, LX = real export, LAB = labour force, LINV = investment, EI = Export Instability Index

Unit root tests

Since macroeconomic time series data are usually non-stationary and thus conducive to spurious regression, all the variables were tested for stationarity using both the ADF and PP tests. The results indicate that we cannot reject the null hypothesis of a unit root at a 5% level of significance for the logarithms levels of real GDP (LQ), real export (LX), and investment (LINV), labour force (LAB), and export instability variable (EI). However, we reject the null hypothesis of a unit root at 5% significant level for the first difference of all the variables, thus providing evidence that the series are integrated of order one, i.e. *I* (1), as shown in Table 5.

Table 5: Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) unit root tests results

Variable	Augmented Dickey Fuller (ADF) Tests				Phillips-Perron (PP) Tests			
	Without Trend		With Trend		Without Trend		With Trend	
	Level	FD	Level	FD	Level	FD	Level	FD
LQ	-2.18	-9.97*	-1.95	-10.10*	-2.25	-9.97*	-2.25	-10.11*
LX	-1.82	-12.01*	-2.56	-12.03*	-1.81	-12.00*	-2.76	-12.03*
LINV	-0.71	-6.00*	-1.60	-6.02*	-0.63	-10.97*	-1.53	-10.99*
LAB	-0.83	-4.87*	-1.98	-4.90*	-0.79	-8.49*	-2.81	-8.53*
EI	-0.91	-3.82*	-2.80	-3.83*	-0.81	-4.10*	-2.79	-4.07*

Note: * denotes significance at the 5% level and FD means first difference. Numbers in the Table are the pseudo t- statistics for testing the null hypothesis that the series is non-stationary. The critical values of the ADF and PP statistics with a constant but no trend are -3.47, -2.88, and -2.57 at the 1%, 5% and 10% levels while test statistics with a constant and trend are -4.01, -3.43, and -3.14 at the 1%, 5% and 10% levels.

Vector autoregressive model (VAR): Lag selection

The lag for VAR is determined by using several criteria. The ultimate first step entails choosing a set of lag lengths for the VARs that produce mathematical stability; that is, the companion matrix has roots less than unity in absolute value (or equal, under cointegration, to plus 1), the Akaike information criterion (AIC), Scwarz Bayesian Criterion (SBC), misspecification tests such as autocorrelation, heteroscedasticity, ARCH and normality (see Appendix). Thus, equation (1) is estimated with 4 lags.

Formulation of an error correction model

Therefore, having established that our variables are stationary, the paper uses the Johansen-Juselius (1990) technique to test for co-integration. Cointegration test results are given in Table 6 below.

Table 6: Co-integration results (with a linear trend)

Panel A - Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.218459	76.17609	69.81889	0.0142
At most 1	0.093593	35.50571	47.85613	0.4216
At most 2	0.069956	19.29159	29.79707	0.4721
At most 3	0.036871	7.325242	15.49471	0.5401
At most 4	0.006804	1.126455	3.841466	0.2885

continued next page

Table 6 Continued

Panel B - Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.218459	40.67038	33.87687	0.0067
At most 1	0.093593	16.21412	27.58434	0.6476
At most 2	0.069956	11.96635	21.13162	0.5510
At most 3	0.036871	6.198787	14.26460	0.5878
At most 4	0.006804	1.126455	3.841466	0.2885

Panel (C): Estimates of co-integrating vector				
Q	**EI**	**INV**	**LAB**	**LX**
1.000	0.48 (2.58)	-0.688 (-2.98)	-0.474 (-4.86)	-0.488 (-3.201)

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The results in Panel A and B of Table 6 report both the trace and maximum eigenvalue statistics for co-integration tests. The null hypothesis of no co-integration can be rejected using -max or the trace statistics. The -max and the trace statistics are both greater than their critical values at 5% level of significance. This implies that there exists a unique co-integrating vector among the variables involved. The co-integrating equation normalised on the growth variable as reported in panel C of Table 6 show that export instability has a negative sign, while investment is positive and their coefficients are all significant as shown by the t–ratio (in, parentheses). The coefficient of INV shows that a 1% increase in INV leads to about a 69% increase in Q in Nigeria. Like in every other developing economy, the results show that investment is important in increasing output in Nigeria. Also, the coefficient of export instability revealed that a unit increase in export instability brings about a 48% decrease in aggregate output. Further, the coefficient of labour force depicts that 1% increase in labour force will increase aggregate out by 47%. The results confirm the importance of export and investment in economic growth in Nigeria.

The paper estimates Equation 2 to examine the relationship between export instability and investment. Table 7 shows the parameter estimates and the standard errors of equation 2.

Table 7: Parsimonious estimates of the adjustment to the long run equilibrium relationships

Dependent variable: log (INV)				
Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**Probability**
Constant	0.02837	0.034376	2.374	0.02434
$\Delta\log(INV)_{t-2}$	0.59776	0.193777	3.346	0.00456
$\Delta\log(EI)_{t-1}$	-0.43785	0.263644	-2.337	0.03453

Adj. R^2 = 0.88 DW= 2.467 AIC=1.89 SIC=1.89 S.E=0.87
F-stat = 8.08 (0.00) RSS= 8.92

Diagnostic tests
Normality = 3.245 (0.1532) LM = 0.5434 (0.5598) Chow=2.9564(0.167589)
ARCH = 1.0687 (0.27642); White = 10.74 (0.09); RESET (1) = 0.13 (0.69)

The coefficient on export instability is 0.44, and it is correctly signed and significant at 5%. The results indicate that export instability has negative effect on domestic investment in Nigeria.

Next, the paper estimated an error correction model (ECM). The attractiveness of ECM is that it provides a framework for establishing links between the short run and long run approaches to econometric modelling. Equation 8 was estimated with four lags using the general to specific approach. The equilibrium correction term generated from the co-integration equations was included.

$$\Delta \log(Q)_t = \delta_0 + \sum_{i=1}^{4} \delta_1 \Delta \log(Q)_{t-i} + \sum_{i=0}^{4} \varphi_i \Delta \log(INV)_{t-i} + \sum_{i=0}^{4} \psi \Delta \log(LAB)_{t-i}$$

$$\sum_{i=0}^{4} \tau_i \Delta \log(E)_{t-i} + \sum_{i=0}^{4} \rho_i \Delta \log(X)_{t-i} + \lambda ECM_t + \varpi_t \quad (8)$$

The coefficient (λ) on the ECM is the speed of adjustment to the long run equilibrium and is of interest because it indicates the behaviour of the changes in output over time, providing additional information on instability. Seasonal dummy variable is included on the basis of statistical and economic rationales, which include correction for the outliers and to reflect the deregulation of the Nigerian economy through introduction of the SAP.

Parsimony was achieved by removing the insignificant regressors and testing the validity of the reduction with an *F* - test. A summary of estimation results is presented in Table 8.

Table 8: Parsimonious estimates of the adjustment to the long run equilibrium relationships

Dependent variable: log (Q)				
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**Probability**
Constant	0.03578	0.02418	2.278	0.0325
$\Delta\log(Q)_{t-2}$	0.46889	0.23556	2.353	0.0276
$\Delta\log(INV)_t$	0.58599	0.18745	3.467	0.0012
$\Delta\log(X)_t$	0.47763	0.04647	3.819	0.0011
$\Delta\log(LAB)_t$	0.29987	0.01394	2.286	0.0237
ΔEI_t	-0.34546	0.04567	-3.749	0.0009
ECM_{t-1}	-0.21996	0.35984	-3.589	0.0007
Seasonal	0.0267	0.00953	2.464	0.0159
Seasional_1	-0.026	0.00998	-2.444	0.0148
Adj. R^2 = 0.90 DW= 2.24		AIC=1.90	SIC=1.96	S.E=0.791
F-stat = 9.16 (0.00) RSS= 7.91				
Diagnostic tests				
Normality =0.655 (0.456)		LM (2) =0.68 (0.76)		Chow =3.96(0.55)
ARCH = 2.47(0.15)		White = 14.44 (0.07)		RESET (1) =0.19(0.68)

The parsimonious vector error correction model (VECM) was subjected to a number

of diagnostic checks, including stability, within equation residual serial correction, heteroscedasticity, and normality tests. The serial correlation LM test, which can test for higher order ARMA errors, shows that the residuals do not exhibit autocorrelation. The ARCH LM test for autoregressive conditional heteroscedasticity shows that there is no ARCH in the residuals. The White's test of the null hypothesis of no heteroscedasticity is accepted. Ramsey's Regression Specification Error Test (RESET) shows that the model is of the correct functional form, and that the disturbance vector has the multivariate normal distribution $N\left(0,\sigma^2,1\right)$. A plot of the recursive residuals shows that the residuals are inside the standard error bands, suggesting stability in the parameters of the model.

During the estimation process, a dummy was included to capture policy changes. Since time series observed that quarterly or monthly frequencies often exhibit cyclical movements that may recur every month or quarter, we included seasonal dummies. The dummy variable is insignificant, though it has the correct sign. It was eliminated from the final regression equation and hence did not form part of the analysis. The remaining variables in the preferred model explained over half (90%) of the regression equation.

The equilibrium error correction term generated from the cointegration equation was included as an additional channel through which the speed of instability can be estimated, often referred to as the speed of adjustment, measured by ECM_t. In the ECM equation, the coefficient of the error term should be negative; that is, the dependent variable should vary in the opposite direction of the error, the deviation from equilibrium. This ensures that the model corrects the deviation from equilibrium, otherwise the system would never converge to equilibrium following a shock. From the results, the error correction term has the correct sign and is highly significant. The speed of adjustment is approximately 0.21, suggesting that, following instability, the system takes a relatively short period to adjust towards equilibrium.

The results show that the coefficient of investment and export are statistically significant at 5%. Further, the results show that a 1% increase in investment and export results in about 0.59% and 0.48% increase, respectively, in aggregate output. This implies that for Nigeria, exports have a higher impact on domestic output than investment. The regression results also show that export instability adversely affects output, with a coefficient that is negative and statistically significant at the 5% level. This result is consistent with other findings for small open economy exports as discussed in the literature review. Its coefficient suggests that a 1% increase in export instability decreases aggregate output by almost 0.35%.

5. Conclusion and policy implications

This study examines the relationship between export instability and economic growth in Nigeria using quarterly time series data from 1970q1 to 2011q4 and Johansen's cointegration method. The results show that there exists a long run relationship among the variables. To capture the short and long run influences of export instability on economic growth, the vector error correction model (VECM) framework was applied. The empirical results suggest that export instability has a negative effect on economic growth in Nigeria. This corroborates the theoretical predictions and is consistent with conventional economic theory, which states that an increase in export instability depresses gross national product and economic growth. Instability of export earnings often causes economic instability, which turns out to affect development plans and economic performance. For instance, a decrease in export prices or volume causes a reduction in export earnings, thus jeopardizing balance of payment positions. This might also lead to increases in unemployment levels, and reductions in the levels of income, savings and investments. For investments, the results show that export instability has a negative effect. Since instability of exports creates income instability, which reduces returns on investments, this often affects the production process and likely has serious adverse effects on growth. Nigeria has designed various policies and schemes to lower export instability, such as the agricultural diversification programme that was recently introduced, and continuous effort is being made to revamp the manufacturing sector.

The specific policy recommendations of this study include the following. First, since export instability has negative effects on economic growth, it is imperative that the government intensifies efforts to reduce reliance on the export of only a few products. The export sub-sector should be diversified by increasing the share of non-traditional exports. Diversification would likely increase the stability of the country's total export earnings only if it involves increases in the share of commodities whose export proceeds are stable. Second, there is a need to increase savings, since export instability creates income instability, which affects investments. It is the expectation that an increase in domestic savings will sustain the level of investment that is adequate to sustain and stabilize the growth path. The findings of this study also suggest that economic growth and investments are highly correlated, implying that an increase in investment will lead to the production of more goods that will in turn propel economic growth. Finally, to bolster Nigeria's financial standing, the government should ensure that the National Sovereign Wealth Fund (NSWF) is properly managed, given the unpredictability of the global export market.

Notes

1. For example, 95% of Ugandan and Zambian exports consists of coffee; and copper and zinc, respectively. Burundi is dependent on the export of coffee and tea to an extent of 87%.

2. The oil sector is the mainstay of the Nigerian economy since the late 1970s. The sector accounts for 95% of export earnings and about 85% of government revenues. The unrest in the Niger -Delta area of the country, and the continuous swings in global oil prices often resulted in revenue gaps.

3. See Meier (1964), UNCTAD (1965), Corden (1974), Love (1992), among others.

4. For some developing countries, instability in international commodity markets often translates into macroeconomic instability, especially if it leads to shifts in aggregate demand and//or aggregate supply.

5. For pioneering studies, see Cairncross (1962), MacBean (1966), Maizels (1968), and Massell (1968).

6. The problem of the agricultural sector was worsened by inappropriate pricing policies, and a dearth of farm labour caused by rural-urban migration and infrastructural inadequacy in the rural areas.

7. The poor performance of the non-oil exports may be due to the appreciation of Naira vis-à-vis other major currencies, high tariff protection, anti-export biases and climatic factors. Other factors include low international demand for commodity exports owing to the development of synthetic alternatives, poor quality of local manufactured goods, and inability to diversify the non-oil export base from commodities to manufactures.

8. Commodity prices fluctuate in response to good or poor harvest caused by variations in weather conditions.

9. The instability index measures the percentage deviations of prices from expected prices at different times, derived from the best-fit trend line. Thus, if prices are relatively stable, the magnitude of deviations will be small and vice versa.

10. This is based on the assumption that fluctuations in export receipts will lead to fluctuations in foreign exchange earmarked for importation of capital goods needed in the development process.

11. The total debt service is the sum of principal repayments and interest actually paid in foreign currency, goods and services on long term debt, interest paid on short term debt and repayments (purchases and charges) to the IMF; see World Bank Development Finance (2011).

12. Rather than continue to subject the economy to the vagaries of international oil price fluctuations, putting away surplus earnings above the budget benchmark was seen as a veritable way of protecting the economy during any shortfall.

13. There was massive repatriation of funds from Nigeria coupled with insider abuse, which led to a collapse of the stock market. The Nigerian Stock Exchange market capitalization plunged from over N12 trillion to about N5 trillion. Also, crude oil prices took a plunge dropping to below 60 dollars.

14. President Goodluck Jonathan in the 2012-2015 medium term fiscal framework sent to the National Assembly admitted the illegality of the Excess Crude Account (ECA) and announced the creation of the National Sovereign Wealth Fund (NSWF).

15. A sovereign wealth fund is a state-owned investment fund composed of financial assets such as stocks, bonds, property, precious metals or other financial instruments.

16. See Ben Hammouda, Karingi, Njuguna and Sadni-Jallab (2010) for useful discussion on exports diversification in Africa, and most especially Nigeria.

17. See Combes and Guillaumont (2002).

18. Investment will likely be channeled into domestic projects with short term profits.

19. The real exchange rate instability is the instability in the relative price of tradable and non-tradable products, which occurs regardless of the nature of exchange rate regimes.

20. For further details on definition and measurements, see United Nations (1952) report on 'Instability in Export Markets of Underdeveloped Countries'.

21. See Ghosh A. R. and J. D. Ostry (1994).

22. For details, see Gooroochurn and Blake (2005).

23. See Leland (1968) for details.

24. See Sandmo (1970).

25. The prediction of the neoclassical growth model is that the output levels of countries with similar technologies should converge to a given level in the steady state. However, a number of recent researchers have shown that the unconditional convergence hypothesis does not appear to be consistent with the empirical evidence.

26. The third possible channel, though not the focus of this study, might be through imports (i.e., by affecting the flow of imports into the domestic economy - thereby creating import instability). The size of export revenue a country accumulates does not in itself reflect its

capacity to finance imports. The capacity to finance imports depends not only on the level of foreign exchange availability but also on import prices.

27. The initial data obtained for labour input did not depict the entire Nigerian labour force. We are now able to collect reliable and consistent data from National Directorate of Employment (NDE) and Federal Ministry of Labour and Productivity on labour force.

28. Due to space constraints, see Jorgenson (1963), Whitman (1981), Mansfield and Reinhardt (2008), and Handley (2011), among others, for the theoretical underpinning of the relationships between investment and export instability.

29. This enables us to distinguish between stationarity due to linear combinations and differencing.

30. Unit root tests are performed using Eviews 8.0

31. It is important to emphasize that setting the value of K is also bound with the issue of whether there are variables that affect the short run behaviour of the model and which, if they are omitted, will become part of the error term. Though residual misspecification may arise as a consequence of omitting these important conditioning variable(s), increasing the lag length is often not the solution but it is usually the case when autocorrelation is present.

32. The reported results here are without constant. However, when a constant was introduced, the results obtained were not significantly different.

33. The signs are reversed because of the normalization process.

34. See Appendix 2 for the original results before removing insignificant regressors.

35. Appendix 3 for the original results before removing insignificant regressors.

36. The seasonal adjustment refers to the process of removing the cyclical seasonal movements from a series and extracting trend component of the series.

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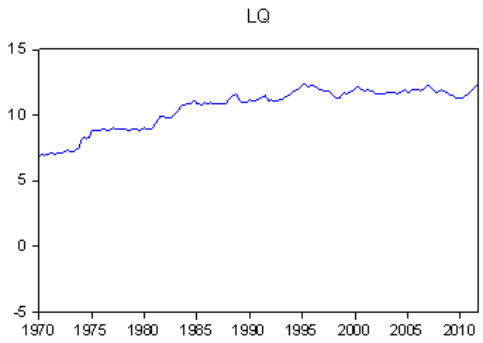
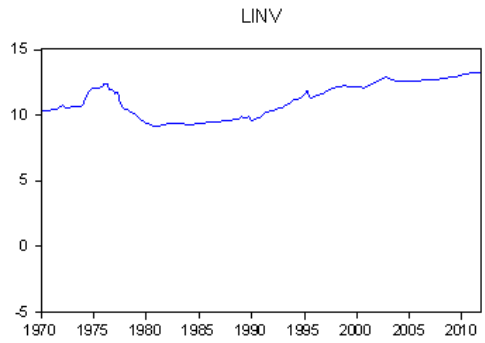
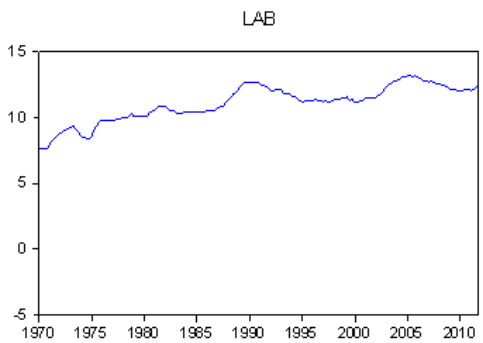
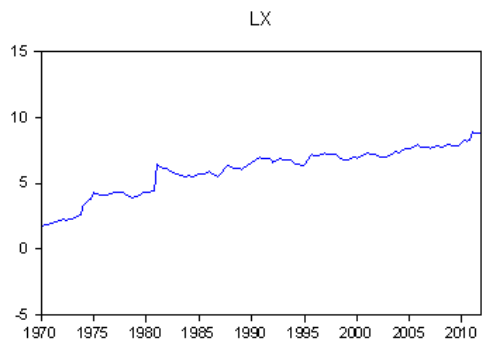
Appendix

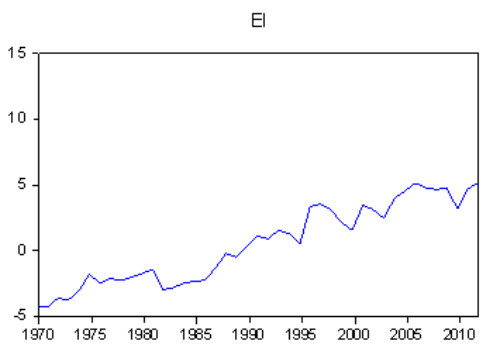
Appendix 1: Plot of the series (same scale)









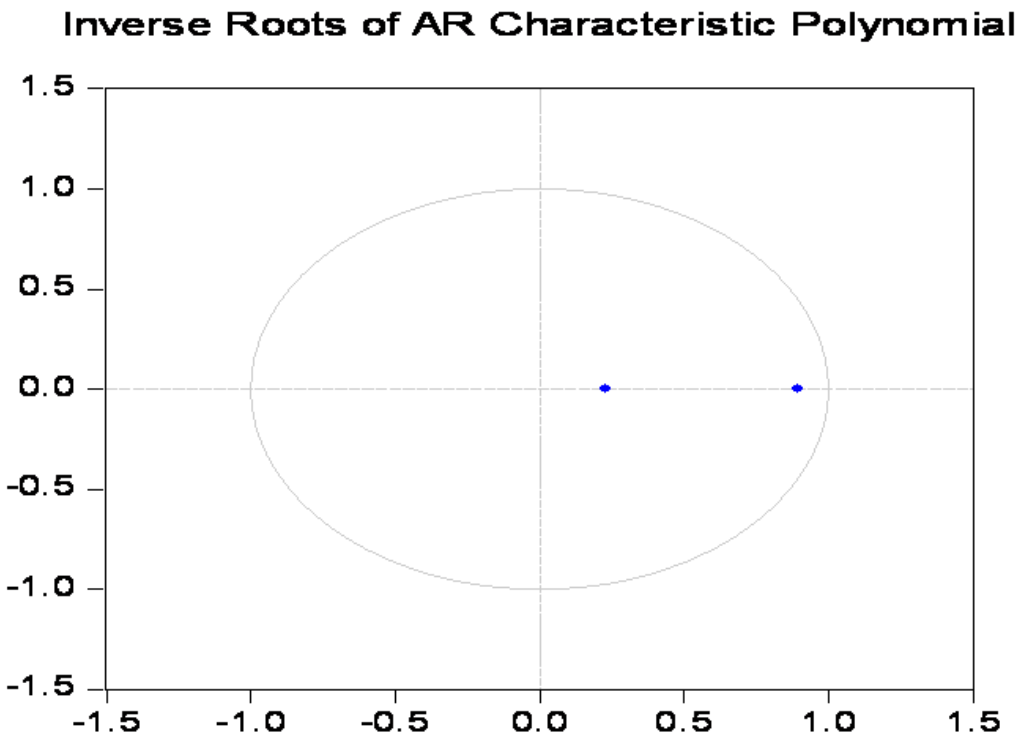


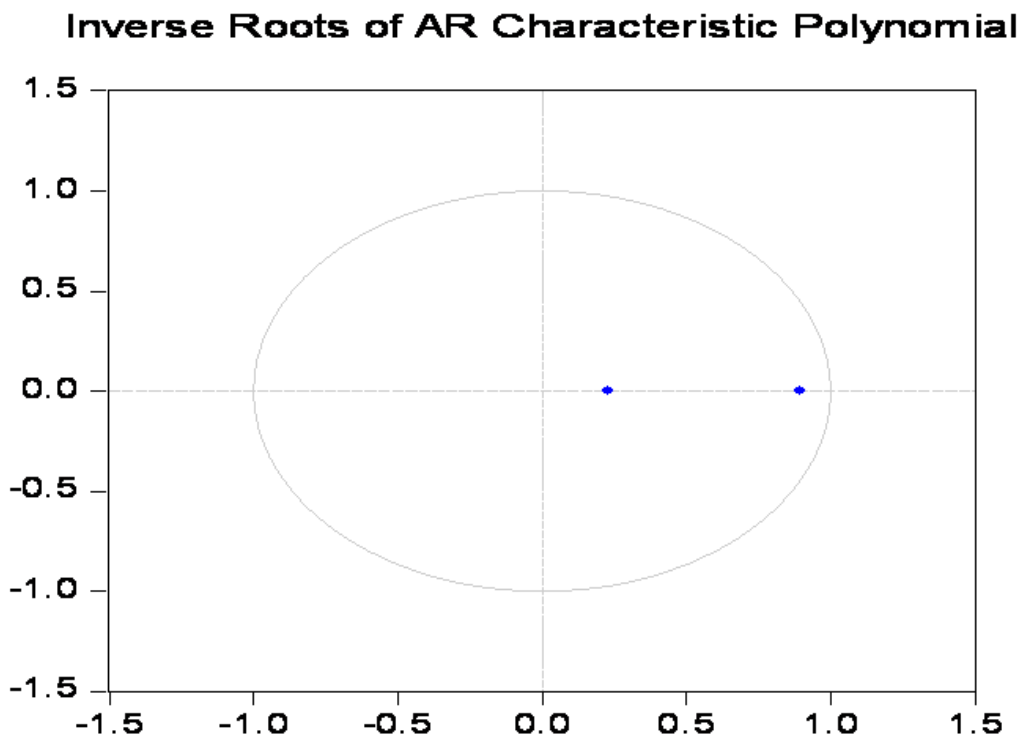
VAR stability condition check

Roots of Characteristic Polynomial
Endogenous variables: LQ
Exogenous variables: LX LAB EI LINV C
Lag specification: 1 4
Date: 07/05/15 Time: 10:28

Root	Modulus
0.895676	0.895676
0.229847	0.229847

No root lies outside the unit circle.
VAR satisfies the stability condition.





Appendix 2: Results of estimates of the adjustment to the long run equilibrium relationships

Dependent variable: log (INV)

Variable	Coefficient	Standard Error	t-statistic	Probability
Constant	0.05417	0.01622	3.347	0.0011
$\Delta\log(INV)_t$	0.04660	0.08876	0.589	0.6114
$\Delta\log(INV)_{t-1}$	0.30906	0.27678	1.127	0.2637
$\Delta\log(INV)_{t-2}$	0.46745	0.27479	2.497	0.0794
$\Delta\log(INV)_{t-3}$	-0.07830	0.06433	-1.218	0.2271
$\Delta\log(INV)_{t-4}$	0.08877	0.10543	0.925	0.3688
$\Delta\log(EI)_t$	0.18654	0.10378	1.786	0.0786
$\Delta\log(EI)_{t-1}$	-0.37967	0.11390	-2.677	0.0135
$\Delta\log(EI)_{t-2}$	-0.11008	0.09875	-1.584	0.1163
$\Delta\log(EI)_{t-3}$	0.00769	0.01498	0.542	0.5733
$\Delta\log(EI)_{t-4}$	0.01855	0.01459	1.651	0.0856
$Dummy_t$	0.06048	0.13097	0.429	0.6678
Seasonal	-0.01167	0.01570	-0.782	0.4978
Seasional_1	0.01872	0.01645	0.887	0.4443

Adj. R^2 =0.90 DW= 2.12 AIC = 1.99 SIC = 1.96 S.E = 0.878
F-stat = 9.119 (0.01) RSS= 7.6504

Diagnostic tests

Normality =0.7489 (0.59230) LM (2) =0.740 (0.80) Chow =3.88(0.71)
ARCH = 2.671 (0.36) White = 11.57 (0.07) RESET (1) =0.22 (0.92)

Appendix 3: Results of estimates of the adjustment to the long run equilibrium relationships

Dependent variable: log (Q)

Variable	Coefficient	Standard Error	t-statistic	Probability
Constant	0.06026	0.15107	1.990	0.0573
$\Delta\log(Q)_t$	0.03687	0.08622	0.427	0.6697
$\Delta\log(Q)_{t-1}$	0.11511	0.08734	1.317	0.1901
$\Delta\log(Q)_{t-2}$	0.33793	0.14040	2.406	0.0177
$\Delta\log(Q)_{t-3}$	-0.11596	0.01472	-0.787	0.4326
$\Delta\log(Q)_{t-4}$	0.21256	0.14652	1.451	0.1496
$\Delta\log(LAB)_t$	0.19704	0.08806	2.237	0.0272
$\Delta\log(LAB)_{t-1}$	0.08431	0.82590	1.021	0.3096
$\Delta\log(LAB)_{t-2}$	-0.04537	0.18489	-0.245	0.8066
$\Delta\log(LAB)_{t-3}$	-0.12211	0.08809	-1.386	0.0168
$\Delta\log(LAB)_{t-4}$	0.21453	0.18158	1.181	0.2399
$\Delta\log(INV)_t$	0.43532	0.09145	4.532	0.0000
$\Delta\log(INV)_{t-1}$	0.22496	0.15277	1.473	0.1437
$\Delta\log(INV)_{t-2}$	0.21006	0.18108	1.160	0.2484
$\Delta\log(INV)_{t-3}$	-0.11511	0.08734	1.318	0.1901
$\Delta\log(INV)_{t-4}$	0.12447	0.14977	0.831	0.4077
$\Delta\log(X)_t$	0.34316	0.15068	2.277	0.0246
$\Delta\log(X)_{t-1}$	0.09819	0.08934	1.099	0.2741
$\Delta\log(X)_{t-2}$	-0.03596	0.08642	-0.417	0.6781
$\Delta\log(X)_{t-3}$	0.21453	0.18158	1.181	0.0169
$\Delta\log(X)_{t-4}$	0.15067	0.09046	1.665	0.0897
$\Delta\log(EI)_t$	-0.31317	0.15068	-3.279	0.0009
$\Delta\log(EI)_{t-1}$	0.01865	0.11000	1.682	0.0954
$\Delta\log(EI)_{t-2}$	-0.13679	0.07764	-1.427	0.1804
$\Delta\log(EI)_{t-3}$	0.19629	0.08766	1.996	0.0380
$\Delta\log(EI)_{t-4}$	-0.78367	0.43756	-1.791	0.0759
ECM_{t-1}	-0.17156	0.05667	-2.198	0.0278
$Dummy_t$	0.01055	0.01491	0.709	0.4804
Seasonal	0.02104	0.00823	3.030	0.0030
Seasional_1	-0.01240	0.00587	-2.118	0.0369

Adj. R^2 =0.93 DW= 2.22 AIC=1.89 SIC=1.97 S.E=0.855
F-stat = 10.23(0.000) RSS= 8.82

Diagnostic tests

Normality = 0.7712 (0.674) LM (2) = 0.693 (0.87) Chow = 4.082(0.67)
ARCH = 2.57(0.32) White = 15.22 (0.06) RESET (1) =0.17(0.772)