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Article

Dynamic relationships among non-oil revenue, government spending and economic growth in an oil producing country: Evidence from Nigeria

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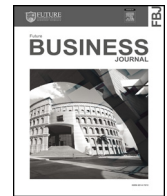
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Dynamic relationships among non-oil revenue, government spending and economic growth in an oil producing country: Evidence from Nigeria

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ABSTRACT

This paper investigated the dynamic relationships among non-oil revenue, government spending and economic growth in Nigeria for the period of 1981 to 2015. After establishing a long run relationship among the variables, the error correction model, impulse responses were estimated as well as the granger causality test among the variables. The results of the short run and long run showed negative effects of government spending on economic growth while non-oil revenue showed positive effect on economic growth. We also found non-oil revenue to have negative shocks on economic growth while the government spending shock was positive. The Granger causality revealed that government spending granger caused both non-oil revenue and economic growth supporting the Keynesian and spend-tax hypothesis in Nigeria over the period of the study. We recommend that the economy of Nigeria should be diversified into non-oil sector rather than relying solely on revenue from oil export.

1. Introduction

Nigeria has been a developing economy with her economic growth being unstable, unpredictable and unsatisfactorily low in recent years especially when compared with some other nations of the world (Machi, 2011). As the largest exporter of oil in Africa and an oil dependent economy, the country has witnessed many oil price shocks and disturbances over the years due to oil price volatility in the international market. The oil price has been fluctuating since the 1980s and the 1990s due to activities of the world powers in the global market. Apart from the incessant drop in the price of oil in the past, the recent notable one was the drastic fall of the oil price from \$112 per barrel in 2014 to almost \$38 per barrel as at the end of 2015 due to the incessant and massive supply of Shale oil by the United States to the global market (British Petroleum Statistical Review of World Energy, 2017). In 2014, according to International Energy Agency (IEA, 2015), Nigeria earned \$77 billion from oil export. However, with the fall in oil price in 2015, Nigeria' oil revenue fell to \$41.33 billion (Organisation for Petroleum Exporting Countries (OPEC) Annual Statistical Bulletin, 2016). By implication, the fall in oil price in the global market implies fall in the revenue accruing to the Nigerian economy and difficulties in achieving a sustainable level of growth. The reason being that over 80 percent of the government revenue comes from oil export. In addition, the monolithic nature of Nigerian economy since the start of oil exploration in the 1970s has been persistently threatened by the fluctuation in oil prices. This has made the government to come to terms with the growing need for economic diversification from oil to non-oil economy.

In the 1960s, prior to the discovery of oil, more than 70% of the rural population of Nigeria engaged in one type of agricultural activity or the other and between 1963 and 1964, the non-oil sector contributed as much as 65% to the Nation's Gross Domestic

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Product (GDP) (Yesufu, 1996). However, the oil boom of 1973/74 changed the economic environment drastically as the windfall from oil boom around this time had a pervasive effect on the Nigerian economy even till the early 1980s. The shocks nevertheless, slowed-down the economic activity and as a result caused severe fiscal imbalances for Nigeria and oil revenues decreased drastically (Audu, 2012). The slow growth process associated with oil endowed countries has been observed in the resource literature by (Ahmed, 2016, Badeeb, Lean, & Clark, 2017, Balsalobre-Lorente, 2018; Sachs and Warner, 2001; Shahbaz et al., 2017). The over reliance on the exogenous and volatile nature of oil revenue led the Nigeria government to make structural changes in order to look into alternative means of financing the economy by reconsidering non-oil sector that had been neglected in the past due to oil exploration (Edame and Efeiom, 2013).

For this reason, non-oil sector, which is referred to as those groups of economic activities that are outside the petroleum and gas industry forms a crucial sector in Nigeria (Ude and Agodi, 2014). The non-oil sector has the potential or capacity to provide food for human population, source of raw materials for industries and thus, promote economic growth. In the 1980s, the contribution of non-oil revenue to economic growth was 40.02%. Between 1980 and 1985, revenue from non-oil increased to 42.27%. In 1995, it was 35.27% after a decade; the non-oil revenue increased to 45.09%. Furthermore, from 2008 to 2014 non-oil revenue has shown tremendous increase from 45.09% to 48.01% (National Bureau of Statistics, (NBS) 2014). This shows that if government devotes much effort to revenue generation from the non-oil sector, the flow of government revenue will be sustainable and appreciable overtime. According to Izuchukwu (2011), the non-oil sectors have the potentials of providing employment opportunities for the teeming population and thereby contributing to the growth of the economy.

The persistent rise in the total government expenditure over the years has been tied to the unpredictable fluctuations in revenue from oil which has led to the unstable growth process in Nigeria. The recent diversification moves of the federal and the state governments in Nigeria solely away from oil to non-oil economy especially due to the recession being experience at present with the negative growth rate of 0.36 percent (National Bureau of Statistics, (NBS) 2016). The debate in the literature has been the rationale for government intervention in the fluctuations of the economy in the short run. The classical economists are of the opinion that the economy will always adjust itself in the long run without the state influence. However, the Keynesian economists submitted that long run adjustment will not take place due to price stickiness as experienced in the United State great depression in 1936 (Keynes, 1936 and Magazzino, 2012). This has since led to several contentions on the role of government spending in the long term growth of national economies. Studies have been conducted on the dynamic relationship between government spending and economic growth on one hand. There are also studies on the relationship between government and revenue on the other hand but with conflicting results. Some studies such as Kumar (2009), Kumar et al. (2009) and Abdullah and Maamor, (2010) are of the conclusion that government spending promotes economic growth (Keynesian hypothesis) while studies such as Ziramba (2009), Ghorbani and Zarea (2009), Yay and Tastan (2009) and Magazzino (2012) advocate that economic growth promotes public spending (Wagnerian hypothesis). There is also the spend-and-tax hypothesis that government spending promotes tax revenue (Hye & Jalil, 2010 and Saunoris & Payne 2010) and tax-and-spend hypothesis that revenue promotes government spending (Eiita & Mbazima, 2008, Wolde-Rafael, 2008 and Magazzino, 2012). The available studies in Nigeria are either on the relationships between non-oil revenue and economic growth (Abogan, Akinola, & Baruwa, 2014; Raheem & Busari 2013; Ude & Agodi 2014 among others) or relationships between government spending and economic growth (Amassoma, Nwosa, & Ajisafe, 2011; Binuomote, 2012; Okoro, 2013 among others). To the best of our knowledge, specific study to date that investigates the dynamic relationship among non-oil revenue, government spending and economic growth in Nigeria is scarce.

This study covers the period of 1981 to 2015. The choice of the starting year is informed by data availability and it was the year of oil boom that resulted in the shift from non-oil sector to the oil sector. The ending year is due solely to data availability. The paper is timely due to the recent diversification move of the federal and the state government away from oil to non-oil economic activities like manufacturing, agriculture, mining, tourism as contained in the Economic Recovery Growth Plan (ERGP) from 2017 to 2020. Lastly, Nigeria can dictate the price and quantities of non-oil commodities unlike the price and quantity of oil which are fixed by the activities in the international market and the OPEC which place limit to the potential growth of Nigeria's economy. It therefore becomes necessary to investigate this area of economic research.

Our results show that long run relationship exists among the variables. The short run and the long run show that non-oil revenue contributes positively to economic growth while government spending contributes negatively to economic growth. The impulse response shows that shocks from non-oil have more negative impact on growth compared to shocks from government spending. Therefore, the outcome of this study would provide more information, understanding and serve as a guide to policy makers, fiscal authorities and governments as regards the interactions among non-oil revenue, government spending and economic growth in Nigeria. The study will also serve as a frame work for further study in this area of economic research. The rest of the paper is as follows. Section 2 gives the literature review, brief history on non-oil reforms is given in Section 3, in Section 4 we have source of data and measurement. Finally, the empirical results are discussed in Section 5 while Section 6 concludes.

2. Literature review

There are many past studies on the relationship between revenue and expenditure on one part and government spending and economic growth on the other part for both developed and developing countries. The nature of the relationship has been inconclusive. The past related studies are reviewed as follows. Ram (1986) examined the impact of government expenditure on growth with the use of production functions specified for both public and private sectors. The data for 115 countries were adopted. The study found government spending to have a significant positive effect on growth. The panel nature of the study excluded the country-specific characteristics of the sampled countries.

Seymour and Oral (1997), after a decade, examined the impact of government expenditure on economic growth for Organisation of Economic Cooperation and Development (OECD) countries. It used a disaggregated approach to focus on the short to medium term impact of fiscal policy. Using fixed effect with a least square dummy variable (LSDV) model, the study found that all the regressors had the correct signs including capital which along with housing, roads, education were insignificant. The non-linear term for education was highly significant and positive corroborate the endogenous growth literature contention that human capital yields increasing returns to scale and nonlinearity in production. The nonlinear term of health was found significant also but was negative implying that health expenditure can be distortionary. Sinha (1998), on the other hand, studied the relationship between government expenditure and Gross Domestic Product (GDP) in China, and found that a strong positive relationship existed between both variables. The Granger causality test showed there was an evidence (though weak) of unidirectional causality, with causality running from government expenditure to GDP. The study only focussed on the response of economic growth to government spending without considering the effect of non-oil sectors.

Moreover, Josaphat and Oliver (2000), investigated the impact of government spending on economic growth in Tanzania for the period of 1965 to 1996 using time series data for 32years. The study formulated a simple growth accounting model by adapting Ram (1986) model in which total government expenditure was disaggregated into expenditure on (physical) investment, consumption spending and human capital investment. It was found that increased productive expenditure (physical investment) had a negative impact on growth and consumption expenditure related positively to growth. Furthermore, Abu-bader and Abu-Qarn (2003) examined the causal relationship between government expenditures and economic growth for Egypt, Israel, and Syria. The study employed multivariate co-integration and variance decomposition approach. In the bivariate framework, the paper found a bi-directional (feedback) effects and long run negative relationships between government spending and economic growth. Moreover, military burden was equally found to have a negative impact on economic growth in all the sampled countries. In conclusion, civilian government expenditures was found to have positive effect on economic growth for both Israel and Egypt. A superior causality test of multivariate framework should have been adopted instead of a bivariate one.

In addition Koman and Bratimasrene (2007) examined the effect of government expenditures and economic growth in Thailand. The study made use of the Granger causality tests. In the analysis, cointegration was not found for government expenditures and economic growth, however, a uni-dimensional relationship was found between the variables. The result showed causality running from government expenditure to growth, and also found significant positive effect of government spending on economic growth. In another study, Junko and Vitali (2008) investigated the impact of government expenditure on economic growth in Azerbaijan. The economic theory adopted used was neo-classical growth model. It was found that total expenditure impacted positively and significantly on the growth of Azerbaijan economy. As regards the relationship between revenue and expenditure, Wolde-Rufael (2008) investigated the causal relationship for 13 African countries. The results were mixed. The result revealed a bidirectional causality from both revenue and expenditure for Mauritius, Swaziland and Zimbabwe. While unidirectional causality from revenue to expenditure was found for Ethiopia, Ghana, Kenya, Nigeria, Mali and Zimbabwe, a unidirectional causality from expenditure to revenue was only found for Burkinafaso.

For the United State (US), Zape and Payne (2009) examined the relationship between expenditure and revenue by employing MTAR and TAR modelling. The result showed that Spend-and-Tax hypothesis was valid for the US. Furthermore, for Romania, Hye and Jalil (2010) investigated the causal relationship between expenditure and revenue using ARDL approach to cointegration. The result indicated that bidirectional was found for both revenue and expenditure. The findings of Saunoris and Payne (2010) also support the Spend-and-Tax hypothesis for the United Kingdom (UK) for the period of 1955 to 2009. The result indicated that expenditure impacted revenue significantly using ECM type threshold autoregression model. For Pakistan, Ilyas and Siddiqi (2010) studied the impact of revenue gap on economic growth over the period of 1980 to 2008. The results reveal that revenue gap is significant and negatively related with economic growth. The econometric results suggested that if the gap between targeted revenue and actual collected revenue is high, it affects economic growth negatively and significantly Dalena and Magazzino (2012) examined the long run relationship between government expenditure and revenue from 1862 to 1993 in Italy. The periods were divided from 1862 to 1913, 1914 to 1946 and 1947 to 1993. Using cointegration, causality techniques and error correction modeling, the results show that the Tax-and-Spend hypothesis prevailed in almost of the periods of study. In addition, Magazzino (2012) examined the relationship between public spending and national income for Italy from the period 1960 to 2008. After the presence of three cointegrating vectors out of the five variables, the granger causality tests show evidence in favour of wagner's hypothesis.

Furthermore, Monir, Ebrahim, and Hamed (2012) examined the effects of oil and non-oil sector export on economic growth for the period 1973 to 2007 in Iran. The study employed the use of the method of vector auto regression (VAR) analysis in predicting the impact of the independent on the dependent variables. The proxy for the dependent variable is real GDP, while the explanatory variables were real oil export and real non-oil sector export. The result of the analysis shows that real non-oil sector export and real oil sector export have positive impact on economic growth. Mohsen, Maysam, and Abbas (2012) examined the causal relationship between the government expenditure and non-oil revenues in a panel of 11 selected oil exporting countries by using panel unit root tests and panel cointegration analysis. The results showed a strong causality from GDP and non- oil revenues to government spending in the oil exporting countries. Yet, government spending does not have any significant effects on revenues in short-run and long-run. Al-Bataineh (2012) investigated the impact of government expenditures on economic growth in Jordan during the period 1990 to 2010. Results from the study suggested that government expenditure at the aggregate level had positive impact on the growth of GDP in compatibility with the Keynesians theory.

Ebaidalla (2013) studied the nature and direction of causality between government expenditure and national income in Sudan using Granger causality test and Error Correction Model (ECM) for the period 1970 to 2008. The result of cointegration test showed a long-run relationship between government expenditure and national income in Sudan. The causality test indicated that the direction

Table 1
Literature review on Nigeria.

Author/Year	Period of study	Variables employed	Methodology	Outcomes
Asanebi (2007)	Not available	Non-oil revenue and GDP	Correlation	Non-oil sector did not promote the growth of the country
Okoro (2009)	1981 to 2000	Non-oil revenue and GDP	Coefficient Analysis	Non-oil sector promoted growth
Usman (2010)	1988 to 2008	Non-oil revenue, Consumer price index, Exchange rate and GDP.	Multi-linear regression	Non-oil sector significantly determined economic growth.
Ogbonna (2010)	Not available	Non-oil export revenue and GDP	OLS	Non-oil sector export failed to impact on GDP
Adebile and Amusan (2011)	Not Available	Non-oil revenue export and agricultural output.	Content Analysis	Non-oil sector export promoted GDP
Amassoma et al. (2011)	1970 to 2010	Government spending on Agriculture and GDP	Error correction modelling	Government spending on agriculture had positive effect on growth
Itodo, Apeh, and Adeshina (2012)	1975 to 2010	Government expenditure and agricultural output	Multiple regression analysis	Government expenditure positively affected agricultural output
Binuomote (2012)	1960 to 2008	Government expenditure and exchange rate, crude oil price agricultural output	Autoregressive Distributed Lag (ARDL) Model	Government expenditure impact significantly on economic growth
Okoro (2013)	1980 to 2011	Government spending and GDP	Granger Causality Techniques	Unidirectional causality from government spending to economic growth
Dada and Oguntegebe (2013)	1961 to 2011	Non-oil revenue and GDP	Granger Causality Techniques	Unidirectional causality from GDP to government spending
Onodugo et al. (2013)	1981 to 2012	Non-oil revenue and GDP	Cointegration	Non-oil sector affected GDP weakly
Ozurumba and Chigbu (2013)	1984 to 2009	Non-oil export revenue, exchange rate and GDP	Granger Causality Techniques	Unidirectional causality from GDP to non oil variables.
Raheem and Busari (2013)	1970 to 2010	Non-oil export and GDP	Simultaneous Equation Model (SEM)	Non-oil sector negatively impacted on economic growth
Abogan et al. (2014)	1980 to 2010	Non-oil export and GDP	OLS and ECM test	Non-oil sector positively impacted on economic growth
Ude and Agodi (2014)	1980 to 2013	Non-oil revenue and GDP	Cointegration and ECM	Non-oil revenue had significant on economic growth

of causality running from government expenditure to national income, both in the short and long-run, in conformity with the Keynesian proposition. Using nine specifications of the Wagner law, [Bojanic \(2013\)](#) tested the relationship between government spending and economic growth in Bolivia for the period 1940 to 2010 using cointegration analysis. The study results provided evidence of a long run relationship between the variables, consistent with the Wagner law. The Error Correction Models showed a bi-directional Granger causality between the variables in six of the specifications used.

Testing the causal relation between government expenditure and economic growth in Jordan in the period 1990 to 2011, [Al-Fawwazl and Al-Sawai \(2013\)](#) investigated the relationship between real Gross Domestic Product (GDP) and real public spending in Jordan for the period 1990–2010 using Vector Autoregressive (VAR) model. The result did not support Wagner's law, but found a unidirectional causality from public spending to real GDP in support of the Keynesian hypothesis. In another study on Jordan, [Al-Zeud \(2014\)](#) found that government expenditure granger causes GDP both in the short run and long run. Furthermore, it supported the Keynesian school of thought which suggests that government expenditure accelerates economic growth in Jordan. [Table 1](#).

3. Non-oil sector reforms in Nigeria

A number of non-oil sector reforms has been undertaken in Nigeria, some of which are Structural Adjustment Programme, National Rolling Plans, National Economic Empowerment and Development Strategy (NEEDS) and Vision 20 2020. The Structural Adjustment Program (SAP) was introduced in mid-1986 as a short-term reform program. It was the most revolutionary approach to solving Nigeria's long-standing economic problems. The gains included reversal of the negative economic growth trend of the early 1980s, achievement of impressive growth rates in the period of 1988 to 1990, substantial boost in government revenue, increase in agricultural exports, improvement in external payments arrangements and international credit worthiness, and a fairly stable investment ratio in spite of excruciating inflation rate. However, this program was not particularly successful in addressing the fundamental economic problems of the country as in most countries where it was introduced. The National Development Plan framework that was suspended following the adoption of SAP in 1986 was re-introduced in 1990 as National Rolling Plan. The first National Rolling Plan of 1990 to 1992 took its bearing from SAP. Accordingly, the plan's general objective was to consolidate on the achievements made in the implementation of SAP as well as address the pressing problems of the economy. The priority programs of the plan included integrated rural development, provision of basic infrastructure, and development of small and medium scale enterprises. The plan was expected to produce cumulative total investment of N144.2 billion at current prices, with public sector contributing 65.3 percent and private sector 34.7 percent.

The plan however lacked adequate coordination and orientation, and according to [Yesufu \(1996\)](#), it was only developed to package the myriads of uncompleted public sector projects. The National Economic Empowerment Development Strategy (NEEDS) is a development planning instrument and framework in Nigeria. NEEDS is a medium-term strategy intended for 5 years starting from 2003 to 2007. This strategy was articulated in 2004 to guide Nigeria's development in the desired direction. It effectively replaced the previous plans in the country, namely the fixed medium term and rolling plans. It identified the problems of the country and prescribed strategies for developing various sectors of the economy such as agriculture, industry, infrastructure and social services. It set up a series of performance targets that government wanted to achieve in 2007. These included a 6 percent annual growth, agricultural GDP of US\$3 billion per year on agricultural exports and 95 percent self-sufficiency in food supply. The NEEDS framework was essentially an articulation of planned policy actions of the federal government, which was expected to be complemented by State Economic Empowerment and Development Strategy (SEEDS) at the state level and by Local Economic Empowerment and Development Strategy (LEEDS) at the local level. ([Amadi and Ogwo, 2004](#); [Sheidu, 2004](#)).

Finally, the Vision 20:20 is an attempt by government to take a long-term view of development issues in the country. The Vision was introduced in 2010 to cover the period 2010–2020 which is to be implemented through a number of medium-term plans using modules such as the medium term fiscal framework (MTFF) and medium term expenditure framework (MTEF). The medium-term implementation plans are incorporated in the long-term vision so that plan policies could be fine turned with each successive implementation plan to re-direct the economy towards achieving the set targets of the vision. The Vision is actually a perspective plan and an economic blueprint that seeks to capitalize on the country's resource endowments to steer the nation towards a sustained growth turn-around such that it could be a significant player in the global economy. To realize the vision, the economy is planned to grow at 14% per annum from 2010 to 2020, while the target for GDP is \$900 billion and per capita of not less than \$4000 per annum. However, the growth rate of Nigeria has not been up to the expectation.

4. Sources and measurement of data

The variables used in this study are gross domestic product (gdp), non-oil revenue and government spending. The variables are sourced from the Statistical Bulletin published by the Central Bank of Nigeria (CBN, 2017). The sample period from 1981 to 2015 is chosen based on data availability. Gross Domestic Product (GDP) implies the market value of all officially recognized final goods and services produced within Nigeria. It is measured in the local currency, Naira. The Non-Oil Revenue (NONR) is all revenue types not covered by oil resources are grouped as non-oil revenue. Basically, it includes company income tax, customs and excise duties, value-added tax which are the three most important sources of non-oil revenue. It is also measured in Naira. Lastly, government spending (GOVSP) includes both the capital and recurrent expenditure incurred during the period of study. It also includes all government consumption, investment and transfer payments for the sample period measured in Naira.

Table 2
Descriptive statistics.

Statistics	Non oil revenue	Government spending	GDP
Mean	730.27	1421.21	17,856.64
Median	166	487.11	4189.25
Maximum	3275.12	5185.32	95,177.02
Minimum	2.98	9.64	94.33
Std.dev	1012.97	1767.65	28,175.25
Skewness	1.36	1.05	1.69
Kurtosis	3.15	2.56	4.43
Jarque Bera	11.14	6.67	19.76
Probability	0.00	0.04	0.00
Sum	25,559.38	4974	6250
Sum sq. dev	3489	1060	2700
Observation	35	35	35

4.1. Descriptive analysis

The descriptive statistics presented in Table 2 shows the non oil revenue, government spending and GDP variables in their units for the study period. The average mean of non oil revenue shows a value of ₦730 billion while that of the government spending and GDP variables are ₦1,421 trillion and ₦17,857 trillion respectively. The values imply that the average value of government spending is almost two times of the non oil revenue during the period of study. This is equally true for the maximum values. The minimum value of the non oil revenue is four times of the government spending variable. The skewness shows a positively skewed distribution for the variables over the sample periods. The significance value at 5 percent for the Jarque Bera indicates that all the variables reject the acceptance of the null hypothesis of normal distribution.

4.2. The model

In order to determine the dynamic relationships among non-oil revenue, government spending and economic growth in Nigeria, this study specifies the endogenous growth model which can be shown in Aghion and Howitt (1992) and Romer (1990) production function known as AK model. The new growth model, otherwise known as the endogenous offers an alternative perspective to the neoclassical growth theory by attributing economic growth to an exogenous independent process of technological progress. The new growth theory provides a theoretical framework for analysing the endogenous growth, persistent growth that is determined by the system governing the production process rather than forces outside the economic system. In contrast, to the traditional neoclassical theory which suggests that saving and investment cannot lead to persistent growth due to diminishing returns and that growth depends only on exogenous technology progress at steady state (Solow 1956). The endogenous model, on the other hand, holds growth to be persistent due to investment in human capital that subdues the rate of diminishing returns. Purposely, endogenous growth model seeks to explain the rate of growth that is left unexplained and exogenously determined in the Solow (1956) neoclassical growth model. Endogenous growth model indicates an active role for government revenue and government spending in promoting economic development through direct and indirect investments in human capital formation (education), infrastructure and research and development. The production function takes the following form:

$$Y = AK \quad (1)$$

Where Y represents the output also known as GDP , K is capital stock and A is technological progress. It is assumed that technological progress augments capital, thus making capital more effective in the economy. This formulation of the production function means that there are constant returns to capital accumulation. However, it must be noted that non-oil revenue constitutes part of the funds the government spends in carrying out its fiscal responsibilities. Thus, government spending can affect the level of capital in the economy because an increase in government spending increases the level of capital and vice-versa. Adopting (Okoro, 2009), capital is decomposed into non-oil revenue and government spending and presented as follows:

$$K = f(NONR, GOVSP) \quad (2)$$

Substituting Eq. (2) into (1), we have:

$$GDP = f(NONR, GOVSP) \quad (3)$$

In line with Ahmad and Masan (2015), this study proceeds by writing Eq. (3) in a linear form as:

$$GDP = \alpha + \beta_1 NONR + \beta_2 GOVSP \quad (4)$$

In econometric term, Eq.(4) can be written as:

$$gdp = \alpha + \beta_1 nonr + \beta_2 govsp + \varepsilon_t \quad (5)$$

Where gdp is the log of Gross domestic Product, $nonr$ is log of non-oil revenue, and $govsp$ is the log of government expenditure, while ε_t

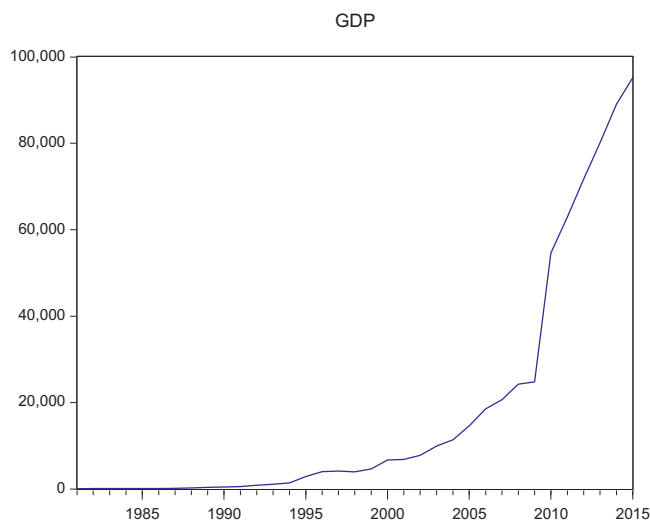


Fig. 1. Gross domestic product.

is the stochastic error term. In order to investigate the dynamic relationship among non-oil revenue, government spending and economic growth in Nigeria, we present Eq.(5) in the VAR form as:

$$\begin{aligned}
 gdp_t &= \Psi_0 + \sum_{i=1}^{\rho+1} \Psi_1 gdp_{t-i} + \sum_{i=1}^{q+1} \Psi_2 nrx_{t-i} + \sum_{i=1}^{\eta+1} \Psi_3 govsp_{t-i} + \varepsilon_{1t} \\
 nrx_t &= \Phi_0 + \sum_{i=1}^{\kappa+1} \Phi_1 gdp_{t-i} + \sum_{i=1}^{\tau+1} \Phi_2 nrx_{t-i} + \sum_{i=1}^{\omega+1} \Phi_3 govsp_{t-i} + \varepsilon_{2t} \\
 govsp_t &= \Omega_0 + \sum_{i=1}^{\nu+1} \Omega_1 gdp_{t-i} + \sum_{i=1}^{\gamma+1} \Omega_2 nrx_{t-i} + \sum_{i=1}^{\pi+1} \Omega_3 govsp_{t-i} + \varepsilon_{3t}
 \end{aligned} \tag{6}$$

The optimal lag length of 2 is selected using the Information Criteria (see the Appendix) to perform the cointegration test, the short and the long run effects, impulse response and the granger causality test after the unit root tests.

5. Empirical analysis

Before applying the unit root tests, we present graphical figures of the variables in order to observe their movements, patterns and

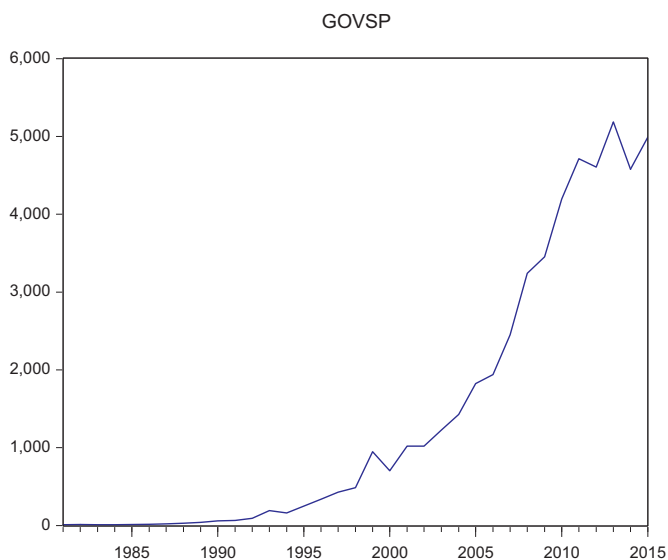


Fig. 2. Government spending.

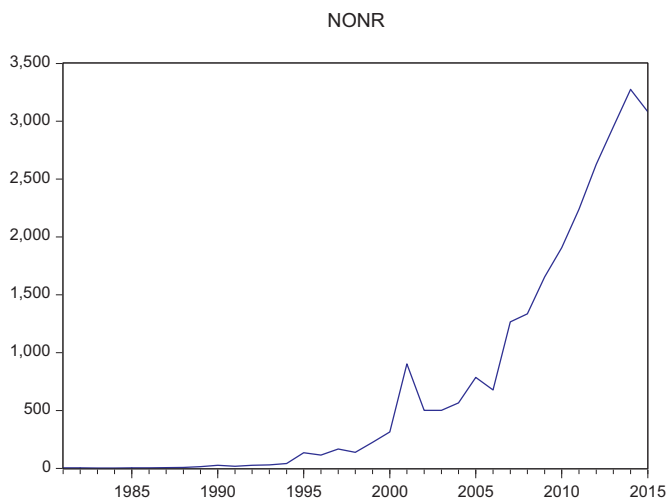


Fig. 3. Non-oil revenue.

behaviours for outliers, aberrant observations and structural breaks (Perron, 1998). For instance, Fig. 1 shows that there is a break in 2008 for the GDP series, while Fig. 2 shows breaks in 2000 and 2012 for government spending series. Similarly, there is a jump in 2001 and a break in 2007 for Fig. 3. The correlation matrix is also presented in Table 3 to show the extent of correlation and relationships among the variable of interest. The correlation as shown in Table 3 implies existence of very high correlation among the variables. A high correlation of 0.95 percent is found between GDP and government spending, while correlation of 0.98 percent is found between non-oil revenue and government spending. In the same vein, a correlation of 0.98 percent is also found between GDP and non-oil revenue, we therefore conclude that close relationships and high correlation exist among our selected variables.

5.1. Structural breaks

Given the breaks and jumps in our variables, we employ both the unit root without structural breaks and the one with breaks (Zivot & Andrews, 1992) in order to ascertain the stationarity properties of our variables and avoid spurious results. From Table 4, the Augmented Dickey Fuller, Dickey-Fuller GLS, Kwiatkowski-Phillips-Schmidt-Shin and the Elliott-Rothenberg-Stock Point-Optimal tests employed indicate that the variables are all non-stationary in their level form and the variables become stationary at their first difference, that is, I(1). In addition, the unit root with structural break presented in Table 5 confirms the non-stationarity of our variable at levels and their stationarity at first difference. The period of the breaks corresponds with the major happenings in the country. The year 2003 witnessed full implementation of the second National Economic and Empowerment Development Strategy (NEEDS) II program to improve the growth of the economy. Finally, the year 2007 and 2008 are periods when the average GDP growth rate of Nigeria was at its peak of around 6.8% (National Bureau of Statistics (NBS, 2016)).

After establishing that the variables are all I(1), we then proceed to test for the existence of long run relationship among them. The multivariate cointegration rank test of Trace and Eigen-value proposed by Johansen (1988) is adopted. This type of cointegration is adopted because it can be used for more than two variables, and it allows for small sample properties as the case for this study (Johansen & Joselius, 1990 and Magazzino, 2012). Moreover, the Johansen maximum likelihood (ML) approach has a number of advantages over the Auto Regressive Distributed Lag bound test (ARDL) by Pesaran Shin, and Smith (2001), Gregory-Hansen, Bayer-Hanck (2013) and the Engle-Granger (1987) two stage approach to cointegration. Apart from being a vector autoregressive (VAR) based method and there is less issue over whether the explanatory variables are exogenous or endogenous. The Johansen ML is a dynamic model that allows for feedback effects unlike the Engle and Granger and ARDL that are single equation models with low explanatory power property. In addition, imposing restrictions are possible to suit any choice model which can be applied to the cointegrating vectors. The choice of vector restriction is not possible with the Engle-Granger approach, ARDL and other methods. The ARDL is also limited due to its single equation approach as the Engle and granger. The Bayer-Hanck (2013), though it is a recent combined cointegration test, yet it does address specific cointegrating vector. Finally, the Johansen ML can be extended to testing for the impulse responses and granger causality test, where the lags in the error correction model can be jointly tested for significance,

Table 3
Correlation Matrix of variables employed.

	GDP	Govsp	Non-oilrev
GDP	1	0.95	0.98
Govsp	0.95	1	0.98
Non-oilrev	0.98	0.98	1

Table 4
Unit root without structural breaks.

Augmented Dickey Fuller Test				Dickey-Fuller GLS (ERS)			
Variables	Levels	First Diff	Status	Variables	Levels	First Diff	Status
GDP	−0.202	−5.3784	I(1)	GDP	0.3339	−4.9974	I(1)
GOVSP	−2.0396	−4.3483	I(1)	GOVSP	0.5341	−5.9312	I(1)
NONR	−0.5372	−7.2796	I(1)	NONR	0.8674	−9.5243	I(1)
Kwiatkowski-Phillips-Schmidt-Shin				Elliot-Rothenberg-StockPoint-Optimal			
Variables	Levels	First Diff	Status	Variables	Levels	First Diff	Status
GDP	0.1159	0.1566	I(1)	GDP	501.69	6.7363	I(1)
GOVSP	0.1121	0.1884	I(1)	GOVSP	554.89	5.8674	I(1)
NONR	0.1565	0.1585	I(1)	NONR	678.45	5.5423	I(1)

Note The critical values for the ADF are -4.2627 , -3.5529 and -3.2096 at 1%, 5% and 10% level, the critical values for ERS are -3.7700 , -3.1900 and -2.8900 at 1%, 5% and 10% level, the critical values for KPSS are 0.2160 , 0.1460 and 0.1190 at 1%, 5% and 10% level, the critical values while 4.2200 , 5.7200 and 6.7000 at 1%, 5% and 10% level for Elliot-Rothenberg-StockPoint-Optimal.

Table 5
Unit root with structural break.

Variables	Levels	Break date	Status
GDP	−1.4310	2008	I(1)
GOVSP	−4.1611	2003	I(1)
NONR	−1.3015	2007	I(1)

The critical values are -5.57 and -5.08 at 1% and 5% respectively

thereby determining any short-run and the long run causality from the explanatory variables to the response variable.

The result of cointegration test compares both the Trace and Maximal Eigen-value statistics along with the critical values. From [Table 6](#), the Trace statistics rejects $r \leq 0$ because the statistics of 35.38 is greater than the critical value of 35.01 at 5% significance level. It does not also reject $r \leq 1$ since the corresponding trace of 6.83 is less than the critical value of 18.40. We therefore conclude that $r = 1$, which implies the presence of 1 cointegrating equations. We also found the same inference of 1 cointegrating equations at 5% using the Maximal eigen-value statistics in [Table 7](#). The presence of cointegration among the variables indicates that there exists long run equilibrium relationship among non-oil revenue, government spending and economic growth. In order to further understand the short run and long-run dynamics, we perform the, error correction model, impulse response shock analysis and the granger causality test.

The short run and long run results presented in [Table 8](#) indicate that the past values of gdp do not have significant effects on the current gdp. This is interpreted to mean that there are no significant effects of the past values of gdp on the present value. In the same vein, government spending does not have a significant effect on gdp in the short run. However, we found the first past value of non-oil revenue to significantly promote gdp in the short run at 5% significance level. 1% increase in non-oil revenue would lead to 0.35% increase in gdp during the period of study. For the long run analysis, we found only non-oil revenue to significantly promote gdp at 1% significance level while government spending has a negative effect on gdp. 1% increase in non-oil revenue would increase gdp significantly by 2.80% while 1% increase in government spending significantly reduces gdp by 3.26% during the period of study. Lastly, the error correction term is well behaved and signed with negative value. It shows a slow speed of adjustment of 0.18% after a deviation from the short run to the equilibrium value.

Next we examined the impulse response to further understand the dynamic interactions among the variables of interest. Specifically, the impulse response analysis traces out the responsiveness of the dependent variables in a VAR model to shocks from each of the variables ([Brooks, 2008](#)). Secondly, it shows the effects of shocks on the adjustment path of the variables. In addition, it shows the size of the impact of the shock plus the rate at which the shock dissolves. Finally, it shows how each variable reacts dynamically to shocks from other variables. The results of the impulse response analysis are presented from [Figs. 4–9](#).

From [Figs. 4 and 5](#), the response of gdp to changes in non-oil revenue and government expenditure is different from the results of the short run and long run analysis. We found gdp to respond negatively to non-oil revenue shocks and positively to government spending shocks over the period of study as opposed to the short run and long run results. In clearer term, gdp is seen to respond

Table 6
Cointegration test of trace statistics.

Cointegrating vector	Eigen-value	Trace statistics	Critical value	Prob.
$r \leq 0^*$	0.5901	35.3755	35.0109	0.04
$r \leq 1$	0.1917	6.8345	18.3977	0.79
$r \leq 2$	0.0007	0.0229	3.8415	0.87

* Denotes the rejection of the hypothesis of no cointegration at 5% significance level

Table 7
Cointegration test of Maximum Eigen statistics.

Cointegrating vector	Eigen-value	Max. Eng. statistics	Critical value	Prob.
$r \leq 0^*$	0.5901	28.5409	24.252	0.01
$r \leq 1$	0.1917	6.8115	17.1477	0.73
$r \leq 2$	0.0007	0.0229	3.8415	0.87

* Denotes the rejection of the hypothesis of no cointegration at 5% significance level

Table 8
The short run and long run results.

Dependent variable:gdp				
Variables	Coefficients	Std-error	t-statistics	Prob.
d(gdp(-1))	-0.0310	0.1876	-0.1654	0.12
d(gdp(-2))	-0.0812	0.2014	-0.4033	0.24
d(govsp(-1))	-0.4527	0.3014	-1.5023	0.31
d(govsp(-2))	-0.0899	0.2863	-0.3140	0.16
d(nonr(-1))	0.3479**	0.1655	2.1090	0.04
d(nonr(-2))	0.1566	0.1440	1.0878	0.15
ecm(-1)	-0.1873**	0.0853	-2.1900	0.03
govsp	-3.2638***	0.5491	-5.9444	0.00
nonr	2.8045***	0.5214	5.3793	0.00

*** and ** indicates 1% and 5% level of significance. Lag length of 2 is found to be optimal from the AIC and SC presented at the [Appendix](#).

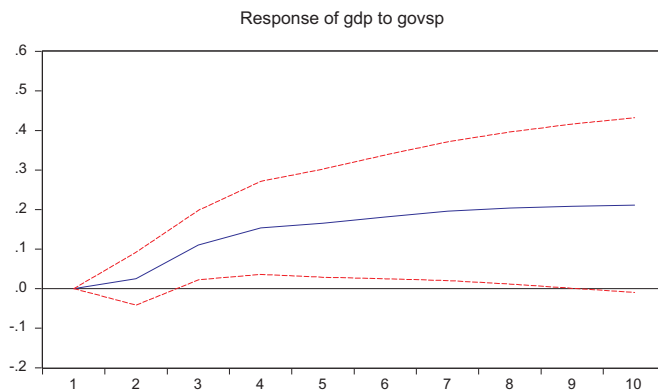


Fig. 4. Impulse response of gdp to govsp.

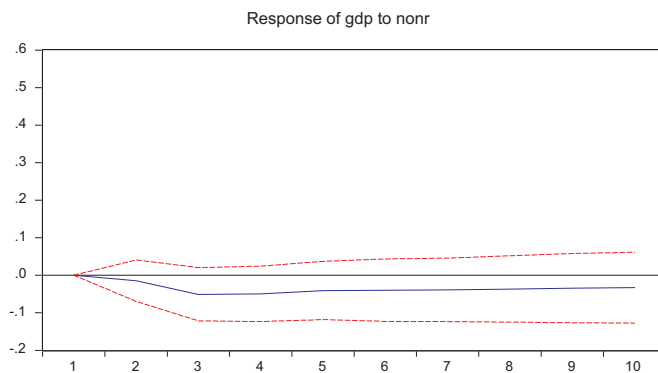


Fig. 5. Impulse response of gdp to nonr.

positively to government spending shocks at 0.1% to 0.2% over the 10 year horizon. On the other hand, the gdp is found to respond negatively to shocks from non-oil revenue at -0.05% over the 10 year horizon. This implies that the shocks from the non-oil revenue has Furthermore, the response of government spending to shocks from gdp is small and it ranges around 0.05% while its response to

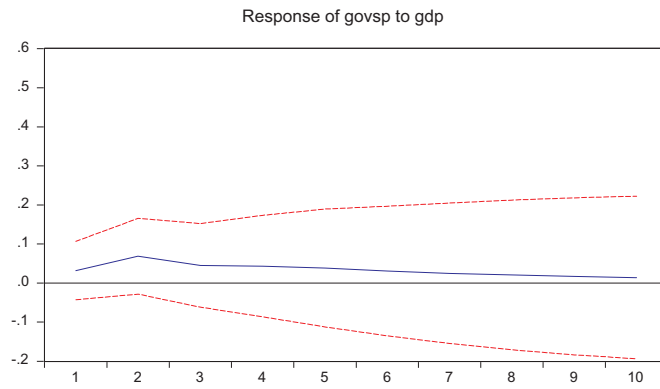


Fig. 6. Impulse response of govsp to gdp.

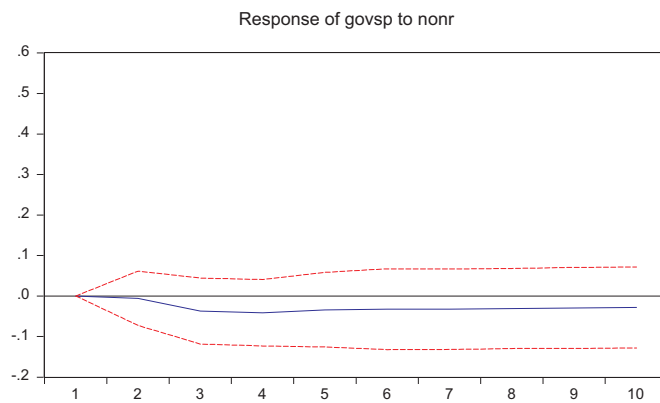


Fig. 7. Impulse response of govsp to nonr.

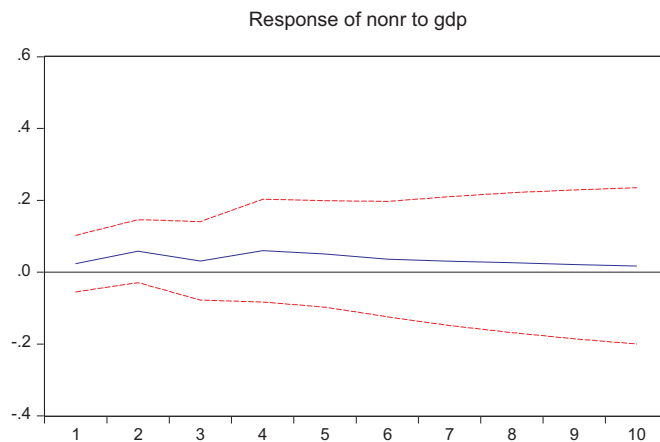


Fig. 8. Impulse response of nonr to gdp.

non-oil revenue is negative at -0.05% over the period of study. Lastly, we found the response of non-oil revenue to shocks from gdp and government spending to be both positive. The response of non-oil revenue to shocks from government spending is larger than its response to gdp shocks. The response of non-oil revenue to government spending shocks increases to 0.2% over the period of study while the response of non-oil revenue to gdp shocks is 0.01% over the period of study. This implies that the response of non-oil revenue to gdp shocks is smaller than that of government spending.

Considering the multivariate granger causality test in Table 9, we found government spending to granger cause economic growth over the period of study at 5% level of significance. This finding supports the Keynesian hypothesis that government spending promotes to economic growth. This outcome supports the findings of Sinha (1998) for Thailand, Koman and Bratinasrene (2007) also for Thailand and Olugbenga and Owoye (2007) for OECD countries, Babatunde (2007) for Nigeria and Govindaraju, Rao, and Anwar (2010) for Malaysia

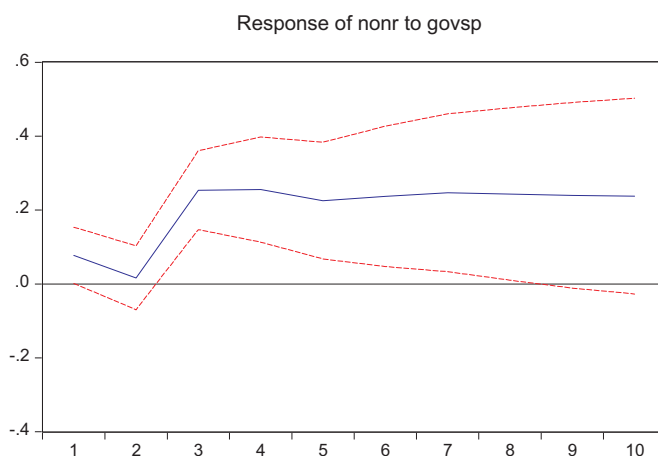


Fig. 9. Impulse response of nonr to govsp.

Table 9
Multivariate Granger Causality/Block Exogeneity Wald Tests.

Dependent			
Variables	gdp	nonr	govsp
gdp	–	2.3943 [0.3021]	8.5007 [0.0143]**
nonr	1.7210 [0.4229]	–	30.5931 [0.0000]***
govsp	1.5241 [0.4667]	0.8605 [0.6503]	–

Notes: *** and ** indicate causality at 1% and 5% significance level. Figures in the squared parentheses “[]” represent probabilities values of the Chi-square distribution at lag2.

that found that causality runs from government spending to economic growth. In addition, government spending is found to granger cause non-oil revenue at 1% level of significance, meaning that government spending significantly explains behaviour of non-oil revenue in Nigeria. This finding also supports the Spend-and-Tax-hypothesis of previous works such as Zape and Payne (2009) for US and Saunoris and Payne (2010) for UK. It implies that government spending is a driver of non-oil revenue in Nigeria.

6. Conclusion

This paper investigates the dynamic relationship among non-oil revenue, government spending and economic growth in Nigeria for the period of 1981 to 2015. After detecting the non-stationarity of our variables, we found cointegration to exist among the variables. The short run and long run results show negative effects of government spending on economic growth while non-oil revenue shows positive effects on economic growth. On the other hand, the shocks from non-oil revenue have negative effects on economic growth while shocks from government spending have positive effects on economic growth over the period of study. The granger causality reveals a unidirectional causality running from government spending to economic growth and a unidirectional causality running from government spending to non-oil revenue. The implications of these findings are as follows. First, there is a significant relationship between government spending and non-oil revenue. Government revenue is found to impact on the non-oil revenue. This implies that proper allocation of government spending on the non-oil sectors will produce positive impact on economic growth in Nigeria both in the short run and long run. This implies that the Keynesian hypothesis holds in Nigeria where government spending is a catalyst for growth. Secondly, the spending-tax hypothesis also holds where government spending is the driving force of revenue generation. Finally, Given that Nigeria is an oil dependent economy with the bulk of government revenue coming from oil export, it is reasonable to recommend that government should diversify the economy away from crude oil and natural gas to non-oil revenue generating sectors such as agriculture, mining, services, and spend more on non-oil sector and thus improve economic growth of Nigeria.

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Appendix A

Table A1.

Table A1
Lag order selection.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-58.17493	NA	0.018647	4.531477	4.675458	4.574290
1	13.13007	121.4826	0.000186	-0.083709	0.492219	0.087545
2	31.18240	26.74419*	9.79e-05*	-0.754252*	0.253621*	-0.454558*
3	36.44677	6.629212	0.000139	-0.477539	0.962280	-0.049405
4	42.40936	6.183427	0.000202	-0.252545	1.619219	0.304028
5	54.62073	9.950002	0.000210	-0.490424	1.813286	0.194589
6	60.25709	3.340066	0.000440	-0.241266	2.494390	0.572188
7	82.80366	8.350581	0.000410	-1.244715	1.922886	-0.302822

Note 1: Note * indicate lag order selected by the criterion; LR, FPE, AIC, SIC, and HQ indicate sequential modified LR statistic, Final Prediction Error, Akaike Information Criterion, Schwarz information criterion and Hannan-Quinn respectively.

Appendix B

Fig. B1.

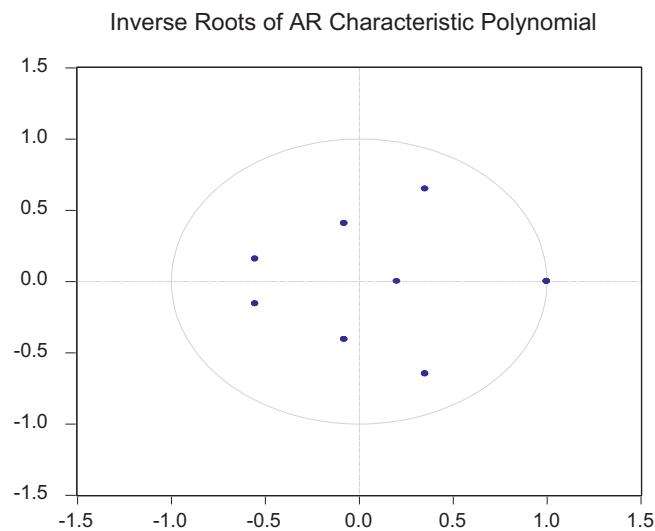


Fig. B1. .

Appendix C

Table C1.

Table C1

Residual Serial Correlation Test.

VAR Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Date: 06/13/17 Time: 19:07		
Sample: 1981 2015		
Included observations: 33		
Lags	LM-Stat	Prob
1	7.728032	0.5618
2	5.105273	0.8250
3	5.787224	0.7610
4	7.860064	0.5483
5	4.402199	0.8830
6	11.21975	0.2609
7	8.821911	0.4539
8	9.123744	0.4259

Probs from chi-square with 9 df.

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