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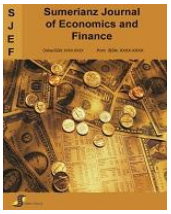

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Dynamic Interaction Between Private Savings, Public Savings and Economic Growth in Nigeria

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Abstract

The paper set out to examine the relationship between private savings, public savings and economic growth in Nigeria from 1970 to 2015. To carry out this investigation, the researcher employed Johanson cointegration test combined with the vector error correction model Wald Granger causality. The results of the analysis revealed the existence of cointegration among economic growth, private savings, public savings, and efficiency in the economy. Precisely, private savings rate have positive effect but insignificant effect on economic growth rate in the longrun, while public savings rate have negative but also insignificant effect on economic growth. Granger causality test reveals that there was bidirectional causality between private savings and economic growth and also between public savings and economic growth. Policy makers should be conscious of this fact, especially when projecting short, medium and long term expenditure of government. A budget proposal whereby the recurrent expenditure is significantly high will increase private income, while a reduction in all form of private and corporal taxes will enhance investment and thus promote economic growth. The government should therefore focus on development of infrastructural facilities to reduce the costs of doing business as well as increase the profitability of firms, thereby raising the economy's production of goods and services.

Keywords: Private savings; Public savings; Economic growth.

1. Introduction

One of the most important macroeconomic objectives of all nations of the world is the growth of their economic. Every nation is keen about the growth rate of its economy as a major indicator of the development and progress of the economy. Thus every economy of the world measure the impact and effectiveness of any policy introduced via the growth of its economy.

It is widely agreed in growth theories that economic growth is majorly determined by its level of capital accumulation in which case countries that save more tend to grow faster. Savings is considered as an indispensable weapon for economic growth and development as its role is reflected in capital formation through increase capital stock and the impact it makes on the capacity to generate more and higher income. Low savings rate has been cited as one of the most serious constraint to sustainable economic growth, thus, World Bank (1989) submits that on the average, third world countries with higher growth rates incidentally are those with higher saving rates. Despite this, many analysts fear that a rising savings rate could hamper the economic recovery of a nation. Since savings is defined as that part of income not immediately spent or consumed but reserved for future consumption, investment or for unforeseen contingencies. Consumer expenditures are such a large component of aggregate demand such that a small decline in consumption could have a noticeable effect on economic growth in as much as more savings means less consumption.

There are a lot of studies on savings and economic growth in Nigeria and other part of the world but studies on savings and economic growth in Nigeria were unable to distinctively define the term savings, as such, clarify the form or component of savings they were referring in their studies, this difficulty may be fallout of unavailability of data on savings in Nigeria (Ariyo, 1996). Recall, national savings comprises of public savings and private savings, which can also be foreign and/or domestic whereas public savings refer to total public sector revenues minus total public sector expenditures, other than investment. In this case, private savings consist of savings from household sector and private corporate sector; household sector comprises of individuals, all non government, non corporate enterprises such as sole proprietorship, partnership owned and controlled by individuals, and nonprofit institutions; the private corporate sector comprises of all nongovernmental financial and non financial corporate enterprises and co-operative institutions. This distinctive study of savings is necessary because increase in private sector savings may be offset by the changes in the public savings, or vice versa, overhauling the effect on the economic growth. Since greater public savings imply either greater tax revenue or lower public expenditure, which indicate lower disposable income for the private sector and hence lower savings. With this, there is tendency for private savings and public savings to exhibit different relation with growth, thus policy made in this stance may be inadequate to propel growth if conclusion is drawn based on aggregate analysis of savings. Though Ibrahim and Akinbobola (2012) submits that the overall effect still bothers on internal source of financing investment, but analyzing their interaction separately will proffer a better policy direction to the government. This study shall differ from Ibrahim and Akinbobola (2012) and others in this respect.

Nigeria economy was perceived as being too public sector oriented, which was criticized for its inefficiency and ineffectiveness. Nigeria government embarks on privatization of the public sector as part of the economic reforms to correct these anomalies in public sector since 1986, thus shifting the engine of the economic growth from public sector to the private sector. The examination of the causal relationship between private savings, public savings and economic growth is very important because it provides useful information on which economic variable(s) that the government and relevant authorities need to control in order to attain the desired level of the targeted variable or variables (Sajid and Sarfraz, 2008). The essence is that if private saving precedes and causes economic growth, then, the policy is to increase private disposable income by reduction in taxations or increase in subsidies; this promotes private savings and thus achieves higher economic growth. On the other hand, if reverse is the case, macro economic adjustment is necessary to accelerate economic growth in order to raise the level of private saving.

However, if public savings precedes and thereby grangercause growth, the policy will be to increasing taxation, remove or reduce subsidy and increase capital expenditure at the expense of current expenditure. On the other hand if growth grangercause public savings the policy will also be a macro economic adjustment to promote economic growth, this may involve either fiscal or monetary policy or both which may however have consequential effect on the availability of social amenities and infrastructural facilities and public investment in the economy.

There are numerous empirical literature explaining the savings-growth nexus, they mostly suffer from a number of shortcomings, among which are; aggregation of savings; reliance on cross section data, which may not satisfactorily address country specific issues; inappropriate econometric techniques and the concentration mainly on the use of the bivariate causality test which could induce spurious significance and inefficient estimates (Gujarati, 2006; Maddala, 2001). This study is therefore a digression from most of these in the sense that, it considers the relationship between disaggregated savings and economic growth in bivariate and multivariate systems for Nigeria and applies better techniques that takes into consideration the stationarity properties of the variables involved.

The rest of the paper is divided into five sections. Following the introduction is section two which presents review of related literature on the relationship between savings and economic growth in Nigeria and other countries of the world. Section three focuses on methodology of the paper while section four analyzes the empirical results. The final section contains conclusions and policy recommendations of the paper.

2. Literature Review

2.1. Theoretical Literature Review

The classical economists as well as endogeneous growth theory postulate that saving constitutes the parameter and determinant of economic growth. The neoclassical growth model of Solow (1956), Cass David (1965), Koopmans (1965), and Ramsey (1928), extensively deliberated on the relationship between saving and growth. It is also central to AK models starting with Harrod (1939), Domar (1946), Frankel (1962), and Romer (1990). All this growth models emphasized capital accumulation as a source of growth and concede that higher saving rate should foster growth because higher saving implies higher capital investment. By implication, direction of causality is from savings to growth.

The two gap model by Chenery and Stout shared the view of Harrod-Domar growth model that physical capital formation is the central driving force of economic growth, so also Lewis (1954) traditional development theory implies that increasing savings would accelerate economic growth. Investment rate determines output, in which case investment is financed by savings, and in an open economy total savings equal the sum of domestic saving and foreign saving (Hjertholm *et al.*, 2000). When domestic saving alone are insufficient to finance required investment to attain a target growth rate, a saving gap arise (Fei and Paauw, 1965; Rosenstein-Rodan, 1961).

On the other hand, Friedman, Ando and Modigliani indicate reverse direction of causality. The Permanent Income Hypothesis of Friedman (1957), differentiates permanent and transitory components of income as determinants of savings. Permanent income is defined in terms of the long time income expectation over a planning period and transitory income is the difference between actual and permanent income. While Ando and Modigliani's Life Cycle Hypothesis posits that, individuals spread their lifetime consumption over their lives by accumulating savings during earning years and maintaining consumption levels during retirement. Consumption theories, such as the permanent income approach and life cycle hypothesis, imply the reverse direction of causality, that is, they imply that people choose their consumption (and also savings) level depending on current and (expected) future income levels. Modigliani (1970), has argued that the simple version of life cycle hypothesis implies a positive relation between savings and income growth. He notes that if there were no income and no population growth across generations, the savings of the young would exactly balance the dis saving of the old and the aggregate saving rate would be zero. Because income growth makes the young richer than the old, the young will be saving more than the old will be dissaving, resulting in the positive association between savings and growth.

However Carroll *et al.* (1994) have argued that the impact of income growth on savings could be negative, ceteris paribus, an exogenous increase in the aggregate growth will make forward looking consumers feel wealthier and thus consume more and save less. On the other hand, if consumption is habit based and changes slowly in response to changing income, a larger fraction of increases in income may be saved resulting in the saving rate increasing with income increases (Carroll *et al.*, 1994). The buffer stock model of savings (Carroll and David, 1994; Deaton, 1991) also yields a similar relation between savings and growth.

2.2. Empirical Literature

There are substantial evidence of a positive and robust relationship between domestic saving and economic growth rates. Evidences abound on the direction of causality between savings and economic growth in Nigeria and

other countries of the world. These causalities were revealed in either direction and sometimes there is dual causality.

2.3. Uni-Directional Causality

The relationship between savings and economic growth is studied using contemporaneous correlation and dynamic models. Edmar (1990), Otani and Villannueva (1990), DeGregorio (1992), and Japelli and Pagano (1994) conducted Ordinary Least Squares (OLS) regression on cross-section data and concluded that a higher savings rate (ratio of savings to GDP) led to higher economic growth. A study of 32 countries by Krieckhaus (2002), notes that a higher level of national savings led to higher investment and consequently caused higher economic growth. Alguacil and Cuadros (2004), employs Toda and Yamamato procedure to analyze causality between savings and economic growth in a multivariate model; he founds that higher savings lead to higher growth in mexico. Sinha and Sinha (2007), examines the relationship between the growth rates of household savings, public savings, corporate savings and economic growth in India using multivariate Granger causality tests. It shows that the causality goes from economic growth to savings for India. Hence, it concludes that higher saving is the consequence of higher economic growth and not a cause. Oladipo (2010), posits that savings causes economic growth in Nigeria in his study using Toda and Yamamato method on data between 1970 and 2006.

Sinha and Sinha (1996), presented evidence that economic growth Granger cause growth rate of savings in Pakistan. Further, Sinha and Sinha (1998) found that causality was from the economic growth rate to growth rate of savings in Mexico. Sinha and Sinha (1999), examined the relationship between the growth rate of savings and economic growth in Sri Lanka. In this study, the causality was from growth rates of gross domestic savings to economic growth rate. Sinha (2000), did similar studies in the Philippines and found causality from economic growth rate to growth rate of domestic savings. Adebiyi (2005), used quarterly data to investigate savings and growth relationship in Nigeria between 1970 and 1998 using Granger causality test and impulse response analysis. He concluded that growth using per capita income is sensitive to and has inverse relation to savings. Sinha and Sinha (2007), examines the relationship between the growth rates of household savings, public savings, corporate savings and economic growth in India using multivariate Granger causality tests. The conventional wisdom suggests that the causality flows from saving to economic growth. It shows that the causality goes in the opposite direction for India. Hence, it concludes that higher saving is the consequence of higher economic growth and not a cause. Abu (2010) submitted that growth precedes savings in his study on Nigeria using pairwise granger causality test on data between 1970 and 2007.

2.4. Mixed Causality

On the other way round (Sinha and Sinha, 1998;1999) finds somewhat different and mixed results for Pakistan using annual data for 1960–1995 and an augmented Granger causality tests in an error-correction framework, he finds that the growth rate of GDP Granger causes the growth rates of both private saving and total saving. Although, the growth rate of private saving is found not to Granger causing growth of GDP, the growth of total saving is found to have granger caused the growth of GDP. He also found similar results for his study on Philippines (Sinha, 2000).

Salz (1999), argued that the higher the income per capita, the higher the consumption and savings rates. This study investigates the direction of causality in 17 third world countries, using the Vector Error Correction (VEC) model for eight countries and Vector Auto Regressive (VAR) model for the other nine countries. The study found that for nine countries the causality was from the economic growth rate to growth rate of savings. For only two countries was the direction of causality reversed. There were four countries where no causality was identified, and for the other two countries bidirectional causality was detected. The author concluded that higher growth rates of real GDP contribute to a higher growth of savings.

Anoruo and Ahmad (2001), investigates the causality of savings and economic growth in seven African countries –namely Congo, Cote d'Ivoire, Ghana, Kenya, Nigeria, South Africa and Zambia using Vector Error Correction Model. The authors found that in four out of seven countries, economic growth Granger cause the growth rate of domestic savings. However, they obtained a bi-directional causality in Cote d'Ivoire and South Africa. Only in the Congo, did the opposite result prevail: the growth rate of domestic savings Granger cause economic growth.

Bassami AbuAl-Foul examines the longrun relationship between real gross domestic product (GDP) and real gross domestic savings for Morocco and Tunisia between 1961 and 2007 using a newly developed approach to cointegration (ARDL). He discovered longrun relationship between the variables in Morocco and no evidence of longrun relationship in the case of Tunisia. A bi-directional causality between savings and growth was discovered in Morocco and causality runs from savings to growth in Tunisia.

Mohan (2006), investigated the relationship between domestic savings and economic growth for various economies. The main conclusion of the study is that income class of a country does play an important role in determining the direction of causality. In Low Income Countries (LICs), the empirical results were mixed. In Low Medium Countries (LMCs), the causality runs from economic growth rate to the growth rate of savings and also in High Income Countries (HICs) except Singapore. Bi-directional is more prevalent in Upper Medium Countries (UMCs).

Mavrotas and Kelly (2001), used the Toda and Yamamoto method to test for Granger causality. Using data from India and Sri Lanka, the relationships among gross domestic product, gross domestic savings, and private savings were examined in this study. The authors found no causality between GDP growth and private savings in India. However, bi-directional causality was found in Sri Lanka. Nicolas (2009), used error correction method in trivariate model to study direction of causality between savings and economic growth in South Africa between 1950 and 2005.

He found bi-directional causality between savings and economic groth in the shortrun and uni-directional causal flow from economic growth to savings in the longrun.

Adeleke (2014), considered the saving-growth nexus in Nigeria using annual data over the period 1970-2013 using ARDL bounds testing approach to co-integration and error correction model (ECM) for short run dynamics, the results revealed a bi-directional causality between savings and economic growth in Nigeria; leading to a feedback effect, such that, both the Keynes and the Solow model are relevant for Nigeria.

2.5. No Causality

Baharumshah *et al.* (2003), investigated growth rate of savings behavior in five Asian countries: Singapore, South Korea, Malaysia, Thailand, and the Philippines. Based on time series data from 1960-1997, using Vector Error Correction Model (VEC), the authors found that growth rate of savings does not Granger cause economic growth rate in the countries, except for Singapore.

2.6. Literature Gap

The relationship between savings and growth can at best be describe as inconclusive, this is because the theoretical and empirical literature is unclear about the direction of causality between them and about whether the association between savings and growth should be positive or negative. These necessitate further studies in this direction. While the bulk of the studies focused on developed countries and only few studies emerged in Nigeria; Most of the studies consider savings in aggregate, ignored individual effect of either private or public savings. This has serious implication on the policy measure and the conceptual analysis of the relationship between savings and the economic growth of the country.

3. Methodology

3.1. Estimation Techniques

To estimate the relationship between savings and economic growth, unit root test was carried out on the main variables to ensure that the variables are stationary using Augmented Dickey Fuller (A D F) and Philips-Peron test. A series x_t is stationary if its mean, variance and autocovarriance are independent of time. A series is said to be integrated of order d, if the series becomes stationary after differencing it d times. In this case, Augumented Dickey Fuller (ADF) is applied by estimating an ordinary least squares equation as follows.

Having measured the stationarity of the variables, we proceed by testing for the joint co-integration of the series. If there is no cointegration in the data, then standard VAR analysis applies. If on the other hand, there exists one or more cointegrating equations, then the VAR should take them into account through an error correction term. To achieve this, we employed both johansen cointegration tests.

The Johansen procedure is described as follows. Defining a vector x_t of n potentially endogenous variables, it is possible to specify the data generating process and model x_t as an unrestricted vector autoregression (VAR) involving up to k-lags of x_t specified as:

$$x_t = \mu + A_1 x_{t-1} + ... + A_k x_{t-k} + \varepsilon_t \qquad u_t \sim IN(0,\Sigma), \qquad 1$$

where x_t is $(n \times 1)$ and each of the A_i is an $(n \times n)$ matrix of parameters. Sims (1980), advocates this type of VAR modelling as a way of estimating dynamic relationships among jointly endogenous variables without imposing strong *a priori* restrictions (Harris, 1995). This is a system in reduced form and each variable in x_t is regressed on the lagged values of itself and all the other variables in the system. If the result allows rejection of the null of a unit root in the estimated residuals, then we can say that the series are co-integrated of order one.

This equation is specified into a vector error correction model (VECM) as below:

$$\Delta x_t = \mu + \Gamma_1 \Delta x_{t-1} + ... + \Gamma_{k-1} \Delta x_{t-k+1} + \Pi x_{t-k} + \varepsilon_t \qquad 2$$

Where $\Gamma_i = -(I - A_1 - ..... - A_i)$,$(i = 1,...., k-1)$ and $\Pi = -(I - A_i - ..... - A_k)$, I is a unit matrix, and A_i $(i = 1,.....p)$ are coefficient vectors, p is the number of lags included in the system, ε is the vector of residuals which represents the unexplained changes in the variables or influence of exogenous shocks. The Δ represents variables in difference form which are I(0) and stationary and μ is a constant term. Harris (1995), states that specifying the system this way has information on both the short and long-run adjustment to changes in x_t through estimates of Γ_i and Π respectively. In the analysis of VAR, Π is a vector which represents a matrix of long-run coefficients and it is of paramount interest. The long-run coefficients are defined as a multiple of two $(n \times r)$ vectors, α and β ', and hence $\Pi = \alpha\beta$ ', where α is a vector of the loading matrices and denotes the speed of adjustment from disequilibrium, while β ' is a matrix of long-run coefficients so that the term $\beta' x_{t-1}$ in Equation (3.32) represents up to $(n-1)$ cointegrating relationships in the cointegration model. It is responsible for making sure that the x_t converge to their long-run steady-state values.

After investigating the longrun relationship between growth, private savings, public savings and efficiency in the economy, granger causality test is carried out between the variables using vector error correction model approach, we therefore employed two steps from Granger (1988), this involved; estimation of the longrun model to obtain ecm term and estimating the granger causality in first difference with ecm term involved in the system.

Granger causality test was developed by Granger (1969), and according to him, a variable is said to granger cause another variable if past and present values of this variable help to predict the other. If the first hypothesis is rejected, then there is no causality. Rejection of the second hypothesis means that there is causality runs from one variable to the other. If none of the hypothesis is rejected, it indicates that the two variables are independent of each other. If all hypotheses are rejected, there is bi-directional causality between the variables. The traditional Granger causality test uses the simple F-test statistic. However, if time series included are not stationery at levels, and are

cointegrated, the traditional granger causality test may not be applicable; this is because it does not have a standard distribution. In this case proper statistical inference would be obtained if the causality is expressed in error correction model term. This was established by Tsen (2006), Joel and Andre (2007). This method enables us to distinguish between the shortrun causality and longrun causality, the Wald-test of the differenced explanatory variables measure the shortrun causality while the significance of the coefficient of error correction term indicates the longrun causality. The coefficient of the ECT implied how fast the deviations from the longrun equilibriums are eliminated following changes in each variable. If the existence of cointegration is established, a multivariate vector error correction model can be developed as follows;

$$\begin{pmatrix}\Delta lgdp\\ \Delta lprs\\ \Delta lpbs\\ \Delta lpop\end{pmatrix} = \begin{pmatrix}\delta_1\\ \delta_2\\ \delta_3\\ \delta_4\end{pmatrix} + \begin{pmatrix}\pi_{11,1} & \pi_{12,1} & \pi_{13,1}\\ \pi_{14,1} & \pi_{21,1} & \pi_{22,1}\\ \pi_{23,1} & \pi_{24,1} & \pi_{31,1}\\ \pi_{32,1} & \pi_{33,1} & \pi_{34,1}\end{pmatrix}\begin{pmatrix}\Delta lgdp_{t-1}\\ \Delta lprs_{t-1}\\ \Delta lpbs_{t-1}\\ \Delta lpop_{t-1}\end{pmatrix} + \ldots\ldots \begin{pmatrix}\pi_{11,k} & \pi_{12,k} & \pi_{13,k}\\ \pi_{14,k} & \pi_{21,k} & \pi_{22,k}\\ \pi_{23,k} & \pi_{24,k} & \pi_{31,k}\\ \pi_{32,k} & \pi_{33,k} & \pi_{34,k}\end{pmatrix}\begin{pmatrix}\Delta lgdp_{t-k}\\ \Delta lprs_{t-k}\\ \Delta lpbs_{t-k}\\ \Delta lpop_{t-k}\end{pmatrix}$$

$$+ \begin{pmatrix}\varphi_1\\ \varphi_2\\ \varphi_3\\ \varphi_4\end{pmatrix}\left(ECT_{t-1}\right) + \begin{pmatrix}\mu_1\\ \mu_2\\ \mu_3\\ \mu_4\end{pmatrix} \qquad \mu_{1\,t} \sim IN(0,\Sigma) \qquad (3)$$

The φ_i coefficients of ECT_{t-1} tested with t-statistics determine the existence of longrun causality while π_i the coefficients of the first difference of the lagged variables tested with chi-square determine the existence of shortrun causality.

3.2. Sources of Data

Annual data are used and the study covers the period 1970 to 2015. Data on GDP, Gross National Income, population and Net Current Transfers were sourced from World Development Indicator while data on private consumption expenditure, public savings were sourced from CBN Statistical Bulletin.

3.3. Definition and Measurement of Variables

Private Savings is defined as Gross National Disposable Income (GNDI) less Private Consumption expenditure (PCE). GNDI is defined as Gross National Income plus net current transfer from abroad (Kivilcim *et al.*, 2002; Nwachukwu and Egwaikhide, 2007; Nwachukwu and Odigie, 2009). Public savings is defined as the difference between government recurrent expenditure and its total revenue at all level of governance. This is deviation from Nwachukwu and Egwaikhide (2007) which defined public savings as overall surplus or deficit as a percentage of GDP. This is because savings is defined as that part of income not immediately spent or consumed but reserved for future consumption, investment or for unforeseen contingencies. Therefore capital expenditures are regarded as savings by this study.

The efficiency rate will be measure as the growth rate of population plus 0.05 (Mankiw *et al.*, 1992). GDP at basic current price measured Economic Growth. All the variables are log linearized to measure the elasticities of each variable, this produces better result and interpretation compared to linear function.

Growth is measured as the natural log of gross domestic product at current prices.

4. Results and Discussions

This section presents the empirical results of stationarity, cointegration, the regressions equation and causality respectively. In addition, relevant tests of significance and overall efficiency of the models were carried out.

4.1. Unit Root Tests

Table 1 presents the empirical results of the Augmented Dickey Fuller and the Phillips-Perron tests. Using the specification in equation (1), the regressions were run for all the series at both level and first difference with intercept and no trend in the equation except LGDP that has both trend and intercept. While on one hand, the AIC criterion was adhered to in the selection of the lag length and ordering of the variables in ADF, default Bartlett was adopted in Phillips-Perron. The nature of the variables were examined through graphical method to examine trend and the intercept, this is necessary to determine whether the unit root should be tested with intercept, trend and intercept or non as may be required by both ADF and PP, all other variables have no trend except LGDP but they all have the intercepts.

From table 1 below, the results shows that all the variables have no unit root at level except LGDP. Meaning, at level apart from LGDP, we reject the null hypothesis of a unit root for all other variables. At first difference, however, the result shows that we reject the null hypothesis of a unit root in favor of the alternative for all the variables. With this, all the variables (LGDP inclusive), are stationary at 1 percent level of significance.

Table-1. Augmented Dickey Fuller and Philip Peron Test

Series	**Level**		**1st difference**	
	Adf (Lag length)	Pp (Bandwidth)	Adf (Lag length)	Pp (Bandwidth)
$Lgdp^{t,i}$	-1.984932 (0)	-2.060785(2)	--6.070115*(0)	-6.070115*(0)
$Lprs^{i}$	-3.727280*(0)	-3.604030*(4)	-4.114848*(5)	-13.94850*(28)
$Lpop^{i}$	-4.065775*(9)	-38.34869*(5)	-4.238014*(0)	--260.2399*(4)
Lpbs	-3.681530*(0)	-3.693022*(3)	-4.019885*(5)	\

Sources: Author's Computations from E-views 9

*indicates 1percent percent level of significance respectively, figures in bracket in ADF column indicate lag length, while figure in bracket in PP column indicate bandwidth. I and t in the superscript of the series denote intercepts and trend respectively.

The result of the table shows that all the variables are stationary in first difference at 1 percent level of significance. Once both ADF and PP tests have established the integral of first order, the next step is to test for cointegration using Johansen maximum likelihood test. The lag length was set based on Akaike Information Criteria and Schwartz Information Criteria. The result is as shown below;

4.2. Johansen Cointegration Test

The table2 below show cointegration test using trace test and maximum eigen value test, both tests indicate two cointegrating equation among lgdp, lprs, lpbs and lpop. Since there is cointegration among these variables traditional F test may not be adequate to measure the causality, therefore we employ wald causality test.

According to Table 2, both maximal eigenvalue and trace statistic tests, our results indicate the existence of two cointegrating vector. Thus, the Johansen cointegration test suggests that there is a long run relationship among private savings, public savings, efficiency in the economy and economic growth and thus suggests causality in at least one direction.

The cointegrating equation in panel B shows that private savings is positively related to economic growth while public savings is negatively related to economic growth but the relation of both as shown by t-statistics in parenthesis are not significant at 5 percent level of significance. The efficiency factor is significant at 1 percent level of significance but it is negatively related to economic growth.

Table-2. Nigeria: Johansen co-integration tests

Panel A: Estimates of λ-max and trace tests			
Hypothesis (H_0:r≤ k)	Trace Statistic		Max-Eigen Statistic
r=1	95.71237*		48.80953*
r≤ 2	46.90284*		33.30469*
r≤ 3	13.59816		13.44271
r≤ 4	0.155443		0.155443
Panel (B): Estimate of co-integrating vector			
LGDP	LPRS	LPBS	LPOP
-1.0000	131.5465 (0.75627)	-128.0940 (-0.76567)	-411.7053 (-10.8970)

Notes: t-ratios are in parentheses. * Significant at 1% level, r is the number of cointegrating vectors
Sources: Author's Computations from E-views 9

The Granger representation theorem states that a system of cointegrated variables has an error correction that combines the short run dynamics of the variables with their long run properties as implied by the cointegrating relationships. Hence, the Vector Error Correction Model (VECM) has been formed and estimated. The Akaike information Criterion (AIC) yielded optimal lag length of six and Schwatz Criterion (SC) yielded optimal lag length of three. When these criteria were subjected to other test, we found a serial correlation at lag three and it also failed normality test among others. We therefore settle for the Akaike information Criterion (AIC).

Meanwhile, we test the nature of causality among the selected macroeconomic variable using the VECM Granger's causality/Wald Block exogeneity test. While the pairwise test tests the degree of causality between two variables, the block exogeneity excludes the influence of all other endogenous variables in the VECM other than the lag of dependent variable under consideration. Table 3 reports the results of the tests. Of particular importance from the analysis is the strong causality/dependence of private savings and economic growth in the economy in the shortrun. The block exogeneity test shows the significant role of past information in the determination of the degree of causality in the level of private savings and economic growth. The direction of causality between the private savings and economic growth is bidirectional. The causality goes from private savings to the economic growth and vice versa. This result confirms not only the Solow's model prediction that savings precedes and causes economic growth; it also validates the Friedman, Ando and Modigliani position which indicates reverse direction of causality.

In case of public savings, in the shortrun, there is also bidirectional causality between the economic growth and public savings in the economy. Government investment in infrastructural facilities have been able to ginger the economy as such grangercause growth of the economy, notwithstanding, the skewness of ratio of expenditure in the economy towards current expenditure at the expense of the capital expenditure in most of the period under study in Nigeria.

The result indicates that there is no synergy between the private sector and the public sector in the country; it indicates that there is no causality between private savings and public savings in the country. This result is reasonable since the efficiency that is presume to be the intermediary or channel between the two does not grangercause any of the two, though both private savings and public savings grangercause efficiency. With increase in infrastructural facilities, public savings leads to efficiency, but this neither lead to increase in private savings nor public savings.

Efficiency in the economy measured by output per effective labour also could not grangercause either of the private savings and the public savings but both private savings and public savings individually grangercause efficiency in the economy. However, there is unidirectional causality from efficiency factor in the economy to the economic growth. This result indicates that both private savings and public savings lead to the efficiency in the economy and efficiency also lead to the economic growth. The transitive relation between public savings and growth could be interpreted that, with increase in infrastructural facilities such as good road networks, electricity, functional and efficient communication system among others, the efficiency of labour will increase and this will lead to increase in economic growth. Also, an increase in private savings has psychological, social and economic effect on the individuals in the household and firms in the corporate organization. Since increase in savings stipulate an increase investment, with the increase in private savings, more capital will be formed in the economy and thus expand economy and have resultant growth effect. The psychological effect it has is in form of confidence and the complacency devoid of any fear at which individual and firm operate.

The fact that private savings grangercauses the growth of the economy anoints the private sector as the engine of the growth of the economy. Policy measure formulate and carefully implemented on the increase of private savings will bring about increase in the growth of the economy. Such policies as lowering tax rate, increase in subsidies will increase the disposable income which is distributed between consumption and savings. With appropriate savings incentives, the resultant effect will be the growth of the economy.

In summary, in the shortrun, there is bidirectional causality between private savings, public savings and growth; (Adeleke, 2014; Mavrotas and Kelly, 2001; Nicolas, 2009)**,** there is no causality between private savings and public savings; there are unidirectional from private savings and public savings to efficiency; and from efficiency to the growth of the economy.

However, in the longrun there is a unidirectional causality from private savings, public savings, and efficiency to the economic growth. This is shown in the significant ECT_{t-1} one percent level of significance. The negative sign of the coefficient point to the longrun stability in the relationship between these variables.

Table-3.

VARIABLES	LGDP	LPRS	LPBS	LPOP	ECT_{t-1}
LGDP		17.30 (0.01) *	14.50 (0.02) **	8.74 (0.19)	-0.137 [-4.50]*
LPRS	17.28 (0.01) *		9.20 (0.16)	11.49 (0.07)	0.012 [0.836]
LPBS	20.69 (0.00) *	8.90 (0.18)		11.64 (0.07)	0.013 [0.83]
LPOP	26.21 (0.00) *	5.89 (0.44)	5.79 (0.45)		0.00[0.72]
ALL	85.68 (0.00) *	28.91 (0.05) **	24.23 (0.15)	15.75 (0.61)	

Sources: Author's Computations from e-views 9

The block Granger causality test is based on a Wald test, which follows a Chi square distribution; The null hypothesis is "no Granger causality". "All" refers to the exclusion of all the endogenous variables from the VECM other than the lags of the dependent variable. Significant test statistics (at 5 percent or better level) are in bold, ***** at 1%, ****** at 5%. P-values are in parenthesis (*), while [*] are t-statistics.

5. Conclusion and Recommendations

This paper investigates the causal relationship between private savings, public savings and economic growth in Nigeria between 1970 and 2015 based on Vector Error Correction model. There has been wide literature on the relationship between savings and economic growth in Nigeria but distinctive studies on private and public savings specifically has not received significant attention in Nigeria. More so the economy of the country is moving towards private sector thrive economy.

The paper set out by checking the time series properties of the variables to avoid incidence of spurious regression and conducts a cointegration test based on the Johansen framework. On the basis of ADF and PP tests, the hypothesis of unit root was rejected for all the variables at first difference and a stable long run equilibrium relationship is established with two cointegrating equation based on trace test and maximum eigen value.

The empirical result suggests that savings and economic growth are positively cointegrated indicating a stable long run equilibrium relationship. Granger causality test reveals that there was bidirectional causality between private savings and economic growth and also between public savings and economic growth. As a tool of policy implementation, it is obvious that both private savings and public savings played an important role in economic growth. A well-channeled savings through investment was an important factor in supporting and promoting economic growth. Policy makers should be conscious of this fact, especially when projecting short, medium and long term expenditure of government. A budget proposal whereby the recurrent expenditure is significantly high will increase private income, while a reduction in all form of private and corporal taxes will enhance investment and thus promote economic growth. Since economic growth and private savings are complementary, we also recommend that government and policy makers should employ policies that would accelerate economic growth. The government

should therefore focus on development of infrastructural facilities; the provision of infrastructure like power, roads, rails, airports, educational facilities and so on will help to reduce the costs of doing business as well as increase the profitability of firms, thereby raising the economy's production of goods and services.

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Apppendix 1

LAG LENGTH CRITERIA

Lag	**AIC**	**SIC**
1	-24.84	-23.7
2	-25.47	-23.66
3	-27.1	**-24.62***
4	-27.33	-24.16
5	-27.53	-23.65
6	**-28.25***	-23.64

Appendix 2

Vector Error Correction Estimates				
Date: 03/08/17 Time: 18:05				
Sample (adjusted): 1977 2015				
Included observations: 39 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LGDP(-1)	1.000000			
LPRS(-1)	-131.5465			
	(173.942)			
	[-0.75627]			
LPBS(-1)	128.0940			
	(167.296)			
	[0.76567]			

LPOP(-1)	411.7053			
	(37.7815)			
	[10.8970]			
C	-247.0486			
Error Correction:	D(LGDP)	D(LPRS)	D(LPBS)	D(LPOP)
CointEq1	-0.137274	0.012328	0.013081	0.000283
	(0.02745)	(0.01474)	(0.01579)	(0.00039)
	[-4.99998]	[0.83611]	[0.82830]	[0.72081]
D(LGDP(-1))	-1.211429	0.240787	0.251244	0.004461
	(0.24551)	(0.13185)	(0.14122)	(0.00351)
	[-4.93441]	[1.82626]	[1.77911]	[1.27099]
D(LGDP(-2))	-1.064635	0.219895	0.225399	0.003744
	(0.31361)	(0.16842)	(0.18040)	(0.00448)
	[-3.39474]	[1.30560]	[1.24948]	[0.83500]
D(LGDP(-3))	-0.687838	-0.089279	-0.072475	0.002647
	(0.24606)	(0.13214)	(0.14154)	(0.00352)
	[-2.79541]	[-0.67562]	[-0.51206]	[0.75254]
D(LGDP(-4))	-0.034505	0.227789	0.229602	-0.001082
	(0.20444)	(0.10979)	(0.11760)	(0.00292)
	[-0.16878]	[2.07472]	[1.95246]	[-0.37006]
D(LGDP(-5))	-0.633996	0.028827	0.027137	0.005738
	(0.16073)	(0.08632)	(0.09245)	(0.00230)
	[-3.94447]	[0.33396]	[0.29352]	[2.49691]
D(LGDP(-6))	-0.313638	-0.160377	-0.151662	-0.002078
	(0.20506)	(0.11013)	(0.11796)	(0.00293)
	[-1.52947]	[-1.45628]	[-1.28576]	[-0.70897]
D(LPRS(-1))	0.541542	-0.873628	-0.119740	-0.110379
	(5.66565)	(3.04270)	(3.25897)	(0.08100)
	[0.09558]	[-0.28712]	[-0.03674]	[-1.36271]
D(LPRS(-2))	-0.837168	-4.442013	-3.523692	0.054520
	(6.20940)	(3.33472)	(3.57174)	(0.08877)
	[-0.13482]	[-1.33205]	[-0.98655]	[0.61415]
D(LPRS(-3))	-1.433164	-3.600365	-2.859449	-0.174232
	(8.25044)	(4.43085)	(4.74578)	(0.11795)
	[-0.17371]	[-0.81257]	[-0.60252]	[-1.47713]
D(LPRS(-4))	-13.19542	-3.091763	-2.626657	0.034264
	(6.88391)	(3.69696)	(3.95973)	(0.09842)
	[-1.91685]	[-0.83630]	[-0.66334]	[0.34815]
D(LPRS(-5))	-13.28970	-0.420894	0.027555	-0.033895
	(6.39136)	(3.43244)	(3.67640)	(0.09137)
	[-2.07932]	[-0.12262]	[0.00750]	[-0.37095]
D(LPRS(-6))	0.122395	-5.200169	-5.129690	-0.063192
	(4.46561)	(2.39823)	(2.56868)	(0.06384)
	[0.02741]	[-2.16834]	[-1.99701]	[-0.98980]
D(LPBS(-1))	0.268187	0.947968	0.199190	0.103107
	(5.46018)	(2.93235)	(3.14077)	(0.07806)
	[0.04912]	[0.32328]	[0.06342]	[1.32083]
D(LPBS(-2))	1.084473	4.345257	3.415551	-0.048375
	(6.02980)	(3.23827)	(3.46843)	(0.08621)
	[0.17985]	[1.34185]	[0.98475]	[-0.56116]
D(LPBS(-3))	2.081499	2.979373	2.278895	0.171147
	(8.06146)	(4.32936)	(4.63707)	(0.11525)
	[0.25820]	[0.68818]	[0.49145]	[1.48499]
D(LPBS(-4))	16.44033	2.382839	1.909481	-0.049518
	(6.74048)	(3.61993)	(3.87722)	(0.09637)
	[2.43905]	[0.65826]	[0.49249]	[-0.51385]
D(LPBS(-5))	15.21189	0.184241	-0.290633	0.032929
	(6.73236)	(3.61557)	(3.87255)	(0.09625)
	[2.25952]	[0.05096]	[-0.07505]	[0.34212]
D(LPBS(-6))	0.038208	4.488338	4.411496	0.057558
	(4.46687)	(2.39890)	(2.56941)	(0.06386)
	[0.00855]	[1.87100]	[1.71693]	[0.90131]
D(LPOP(-1))	-14.61015	-0.030517	0.634232	0.568662

	(18.3065)	(9.83141)	(10.5302)	(0.26172)
	[-0.79808]	[-0.00310]	[0.06023]	[2.17278]
D(LPOP(-2))	12.66585	17.08698	17.63527	-0.214655
	(18.9106)	(10.1558)	(10.8777)	(0.27036)
	[0.66978]	[1.68248]	[1.62124]	[-0.79397]
D(LPOP(-3))	-8.405836	-13.20353	-14.31814	0.257535
	(17.9282)	(9.62821)	(10.3125)	(0.25631)
	[-0.46886]	[-1.37134]	[-1.38842]	[1.00477]
D(LPOP(-4))	-34.76498	3.384581	3.579036	0.102624
	(10.1020)	(5.42521)	(5.81081)	(0.14442)
	[-3.44140]	[0.62386]	[0.61593]	[0.71057]
D(LPOP(-5))	-22.90722	2.520577	2.505933	0.058048
	(9.31477)	(5.00244)	(5.35799)	(0.13317)
	[-2.45924]	[0.50387]	[0.46770]	[0.43590]
D(LPOP(-6))	0.432210	-0.194857	-0.208279	0.003111
	(0.29977)	(0.16099)	(0.17243)	(0.00429)
	[1.44182]	[-1.21038]	[-1.20790]	[0.72584]
C	0.372218	-0.034476	-0.038346	-0.001158
	(0.06970)	(0.03743)	(0.04009)	(0.00100)
	[5.33998]	[-0.92098]	[-0.95638]	[-1.16228]
R-squared	0.888783	0.797527	0.763019	0.761335
Adj. R-squared	0.674903	0.408156	0.307286	0.302365
Sum sq. resids	0.026857	0.007746	0.008886	5.49E-06
S.E. equation	0.045452	0.024410	0.026145	0.000650
F-statistic	4.155531	2.048244	1.674267	1.658789
Log likelihood	86.63691	110.8822	108.2044	252.2985
Akaike AIC	-3.109585	-4.352936	-4.215609	-11.60505
Schwarz SC	-2.000544	-3.243895	-3.106567	-10.49601
Mean dependent	0.090308	0.000375	0.000256	-0.000498
S.D. dependent	0.079717	0.031729	0.031413	0.000778
Determinant resid covariance (dof adj.)		2.03E-18		
Determinant resid covariance		2.50E-20		
Log likelihood		658.7842		
Akaike information criterion		-28.24535		
Schwarz criterion		-23.63856		