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Savings, Investment and Economic Growth Nexus in Nigeria

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Abstract
The economists disagree about the order of causality among savings, investment and economic growth. Moreover, the order of causality among savings, investment and economic growth has not been adequately or fully established in economic literature. As a result of these problems, we decided to establish the order of causality among gross domestic savings, gross domestic investment and economic growth in Nigeria from 1986 to 2017 using Vector Autoregression (VAR) model. The annual time series data of gross domestic savings, gross domestic investment and gross domestic product, a proxy of economic growth that are obtained from World Bank World Development Indicators are used in the estimation of the model. The results of the impulse response functions and variance decomposition reveal that the order of causality among gross domestic savings, gross domestic investment and gross domestic product in Nigeria, runs from gross domestic savings to gross domestic investment, gross domestic investment to gross domestic product and gross domestic product to gross domestic savings. There would be steady growth of output if adequate savings are mobilized for investment expenditures in Nigeria.
Keywords: Gross domestic savings, Gross domestic investment, Economic growth, Vector autoregression model, Nigeria
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1. Introduction

The major task of the economists is to establish the order of causality among economic variables so that appropriate economic policies that enable us to achieve the main macroeconomic objectives can be put in place. The order of causality among savings, investment and economic growth is not adequately or fully established in economic literature. Moreover, there is disagreement among economists about the order of causality among savings, investment and economic growth at both theoretical and empirical literature. The following discussions illuminate the above statements.

In classical view, savings Granger causes investment but savings and investment do not Granger cause economic growth because it is assumed that the capitalist economic system always tend towards the full employment level of output. As a result of this believe, the classical economists do not explain how a change in economic growth would affect savings and investment. According to them, savings and investment do not depend on income but they are functions of interest rate.

In Keynesian economic theory, economic growth positively Granger causes savings and investment and investment positively Granger causes economic growth but savings negatively Granger causes economic growth when savings exceeds investment and this they called the paradox of thrift or savings positively Granger causes economic growth when savings is equal to investment. The Keynesians do not explain the cause and effect relationship between savings and investment. According to them, savings is a positive function of income but investment depends on income and non-income factors: profit expectation, risk associated with investment, final demand, existing stock of capital and availability of new technology.

In Harrod-Domar model, savings Granger causes investment and investment Granger causes economic growth but Harrod (1939) and Domar (1946) do not explain the effect of a change in economic growth on savings and investment. In view of the above discussions, each of the three schools of economic thought mentioned above could not fully explain the order of causality among savings, investment and economic growth. Moreover, the order of causality among savings, investment and economic growth as explained by each of these three schools of economic thought are not in tandem with each other.

The classical theory suggests that savings has no effect on economic growth. The Keynesian economic theory indicates that savings has negative or positive effect on economic growth. The Harrod-Domar model shows that savings has positive effect on economic growth. Due to these divergent views among economists about the effect of savings on economic growth, one is not certain of the appropriate savings policy to put in place in order to achieve the desired level of output. There are several empirical studies on savings, investment and economic growth nexus in Nigeria. For example, Akinola and Omolade (2013), Nwanne (2014) and Odey et al. (2017) conducted a research on savings, investment and economic growth nexus in Nigeria but they could not establish the order of causality among these three economic variables. The Ordinary Least Square method used by Nwanne (2014) and Error Correction Model employed by Odey et al. (2017) are not appropriate for their studies because they are not useful in dealing with multivariable causality. They could have used the Vector Autoregression (VAR) technique because it is very useful in dealing with multivariable causality.

In view of the above statement of the problem, this study is guided by the following research question. What is the order of causality among savings, investment and economic growth in Nigeria? The main objective of this paper is to establish the order of causality among savings, investment and economic growth in Nigeria. This paper consists of five sections. The next section is literature review. Section 3 presents the methodology. The results are discussed in section 4 and conclusions are drawn in section 5.

2. Literature Review

Say (1830) states that supply creates its own demand. In other words, the income that is created in production process is always sufficient to buy all the goods and services produced. This means that the purchasing power in an economy is always sufficient to buy all the goods and services produced. That is, aggregate supply of goods and services is always equal to aggregate demand for goods and services. The idea that supply creates its own demand is known as Say's Law.

Say's Law is the basis of classical macroeconomics and it is based on self-regulating markets. The self-regulating credit or money market ensures that savings does not invalidates Say's Law. The credit market ensures that incomes that are saved by households flows into the hands of businesses that use them for investment expenditures. The classical economists believe that savings is an increasing function of interest rate and investment is a decreasing function of interest rate. Given that savings and investment depend on interest rate that is flexible in both downward and upward directions, the flexible interest rate will always adjust to equate savings by households with investment expenditures by businesses. The income that is withheld by households from circular flow of income is deposited in banks that lend it to businesses that inject it back into the income stream as investment. The classical economists believe that whatever amount of income is saved, it will be fully offset by investment expenditures.

If savings is fully offset by investment expenditures, Say's Law will be valid and overproduction, persistent unemployment or fallen output would be impossible. Say's Law and simple theory of self-regulating markets made the classical economists to conclude that overproduction, persistent unemployment and fallen output are impossible in a capitalist economic system. In other words, the private demand is always sufficient to buy all the goods and services produced. In classical theory, there cannot be too much savings; the more savings, the more investment and the whole complex process takes place without any change in income since it is assumed that the capitalist economic system always tend towards the full employment level of output. Thus, the classical economists formulate the savings leads investment and the neutrality of investment hypotheses.

Keynes (1936) challenges the classical theory based on the following reasons. Income can be created in the production process but may not be used in buying goods and services. Savings may not be transmitted into investment. Although savings and investment respond to interest rate, there are other more important factors to be considered in the savings behaviors of households and investment decisions by businesses. These other more important factors can keep interest rate from performing its vital function of equating savings with investment.

For example, Keynes identified the following non-interest rate motives for saving by individuals: (1) to build a reserve against unforeseen events; (2) for retirement; (3) for an increased standard of living; (4) to gain economic independence; (5) to build a reserve for speculative purposes; (6) to leave an inheritance; and (7) to satisfy greed. These motives, he argued, generate saving regardless of the level of the interest rate (Amacher and Ulbrich, 1986).

According to him, the interest rate is not an important factor to consider in the business decision to invest. Investment is mainly influenced by profit expectation and the risk associated with investment rather than interest rate. Investors are willing to under-take investment if they expect high return on investment even if the interest rate is very high. The investors will not be tempted to under-take investment if the risk associated with the investment is very high even if the interest rate is very low. The final demand, existing stock of capital and availability of new technology also play a role in the business decision to invest.

Given that other factors influence savings and investment more strongly than interest rate, Keynes concluded that savings may exceed investment at full-employment level of output, making Say's Law invalid. That is the private demand may not be sufficient to buy all the goods and services produced. Consequently, general overproduction, prolonged periods of unemployment and fallen output are possible in a competitive market economy. Therefore, Keynes suggests the use of fiscal policy to the government in order to increase aggregate demand, output and employment.

When Keynes criticizes savings, he does so in the context of an economy with deficient demand due to excess savings over investment and which equilibrium output is less than the full-employment level of output. An increase in savings causes consumption expenditures to fall and this makes demand to become more deficient. The decrease in consumption expenditures causes output to fall through the multiplier process. The greater the household savings, the lesser is the income. This is what Keynesians called the paradox of thrift. Moreover, the intention to increase savings does not result to any increase in actual savings.

There are two views of Keynes with respect to the savings-investment equality. The first is the accounting or definitional equality between savings and investment that is used in national income accounting. It shows that

actual savings and investment are always equal at any period of time and at all levels of income. Symbolically,

$$S_t = Y_t - C_t \quad - - - (1)$$
$$I_t = Y_t - C_t \quad - - - (2)$$

Where Y is income, C is consumption, S is savings and t is time in the current period. Since $Y_t - C_t$ is common in equations (1) and (2), we can say that savings is equal to investment. Symbolically,

$$S_t = I_t \quad - - - (3)$$

The expressions in equations (1) and (2) can be re-arranged and written as follows:

$$Y_t = C_t + S_t \quad - - - (4)$$
$$Y_t = C_t + I_t \quad - - - (5)$$

Since Y_t is common in equations (4) and (5), we can say that:

$$C_t + St = C_t + I_t \quad - - - (6)$$

Since C_t is common in equation (6), we can say that:

$$S_t = I_t \quad - - - (7)$$

Based on the accounting or definitional equality between savings and investment, Keynes states that savings and investment are always equal. He disagrees with the classical view that savings-investment equality takes place only at full employment level of output. He believes that since full employment level of output is a rare phenomenon, savings-investment equality can take place at less than full employment level of output.

The second is the functional equality between savings and investment. The savings-investment equality in the functional or schedule case is brought about by the adjustment mechanism of income rather than the classical view of the adjustment mechanism of interest rate. In this scenario, savings and investment are equal only at the equilibrium level of income. Both savings and investment are increasing functions of income. When savings is greater than investment, income falls, and when investment is greater than savings, income rises. This dynamic adjustment mechanism in income, savings and investment will continue until savings and investment are not only equal but are also in equilibrium. Keynes believes that economic growth will increase only if the savings by households is equal to investment expenditures by businesses.

According to Harrod (1939) and Domar (1946), savings increases economic growth through an increase in investment. They believe that the main purpose of savings is for investment and so when savings increases, investment increases and an increase in investment will lead to an increase in economic growth. The Harrod-Domar model is specified as follows:

$$G = (\Delta Y/Y) = (s/k) \quad - - - (8)$$

Where G is growth rate of output, Y is output or income, s is the savings rate and k is capital output ratio. The model shows that growth is directly related to savings. Increasing the savings rate will increase the growth rate of output because savings generates investment which in turn stimulates economic growth.

There are several studies on savings, investment and economic growth nexus in many countries of the world. Attanasio et al. (2000) examine the short run and long run relationship among savings, investment and economic growth for 123 countries from 1961 to 1994 using ordinary least square method, Granger causality test and impulse response functions. The results of the investigation show that lags of saving rates are positively related to investment rates, investment rates negatively Granger causes economic growth rates and economic growth rates positively Granger causes investment rates.

Verma and Wilson (2005) investigate the relationship among savings, investment, foreign inflows and economic growth in India from 1950 to 2001 using ordinary least square regression model. The results indicate that savings and investment have an influence on economic growth while economic growth has insignificant impact on savings and investment.

Verma (2007) determines the relationship among gross domestic savings, gross domestic investment and economic growth in India from 1951 to 2004 using Autoregressive Distributed Lag (ARDL) bounds test. The results of the investigation reveal that economic growth, gross domestic savings and gross domestic investment have a long run relationship except when economic growth is the dependent variable. The results show that gross domestic savings does not determine economic growth, but economic growth determines gross domestic savings. It is found that gross domestic savings generates investment both in the short run and in the long run and gross domestic investment stimulates economic growth in India during the period.

Ramesh (2011) examines the direction of causality among savings, investment and economic growth in India from 1951 to 2008 at both aggregate and sectoral levels using Granger causality test, Johansen co-integration test and vector error correction model. The results of the co-integration tests indicate that there is a long run relationship among all the variables except private corporate savings. It is found that the direction of causality runs from savings and investment to economic growth collectively as well as individually and there is no causality from economic growth to savings and/or investment.

Budha (2012) examines the relationship among savings, investment and economic growth in Nepal from 1975 to 2010 using Autoregressive Distributed Lag (ARDL) approach to test for co-integration and Granger causality test. The results of the investigation reveal that there is evidence of co-integration among savings, investment and

economic growth when each of them is taken as dependent variable. The results of the Granger causality test indicate that there is bi-directional causality between investment and economic growth as well as between savings and investment. There is no evidence of causal relationship between savings and economic growth in Nepal within the period under investigation.

Mohamed (2014) determines the causal relationship among savings, investment and economic growth in Ethiopia from 1970-2011 using Autoregressive Distributed lag (ARDL) bounds test. The result of the investigation shows that there is long run relationship among savings, investment and economic growth when GDP is taken as dependent variable. The result also show that investment has significant positive effect on economic growth in Ethiopia both in the short run and in the long run while the effect of savings on economic growth is statistically insignificant.

Hundie (2014) analyzes the causal relationship among savings, investment and economic growth in Ethiopia from 1969 to 2011 using ARDL approach to co-integration and Toda-Yamamoto and Dolado-Lutkepohl Granger-causality tests. The results of the ARDL bounds test indicates that there is evidence of co-integration among gross domestic savings, gross domestic investment, gross domestic product, labor force and human capital when GDP is taken as dependent variable. Labor and investment have significant positive effect on economic growth in both the short run and long run while gross domestic savings and human capital are statistically insignificant. The results of Toda-Yamamoto and Dolado-Lutkepohl as well as Innovative Accounting Technique to Granger causality analysis shows that there is a bi-directional causality between gross domestic investment and economic growth as well as between gross domestic savings and gross domestic investment. Granger causality running from investment to savings and from investment to economic growth is confirmed and it is statistically significant as shown in the results of impulse responses and variance decompositions. A unidirectional Granger causality running from economic growth to gross domestic savings is observed although it is statistically insignificant.

Ruranga et al. (2014) analyze the relationship among real gross domestic product, domestic investment, foreign direct investment, domestic savings and trade in Rwanda from 1970 to 2011 using VAR and Granger causality test. Granger causality test shows that there is bi-directional causality between gross domestic product and trade and trade and domestic investment and unidirectional causality from gross domestic product to domestic investment, from domestic savings to gross domestic product, from domestic savings to domestic investment and from domestic savings to trade. Domestic savings has significant impact on gross domestic product, domestic investment and trade. There is no evidence that domestic investment Granger causes gross domestic product. The estimated VAR results reveal that forecasted values of gross domestic product, domestic investment and foreign direct investment are 3,843.6233 million, 22.67% and 0.95% respectively in 2011 while their actual values are 3891.9 million, 22.7% and 1.66% respectively in the same period of time. These results show that there is under-prediction for gross domestic product, domestic investment and foreign direct investment. The differences are explained by the efforts of the Government of Rwanda to promote gross domestic product, domestic investment and foreign direct investment.

Akinola and Omolade (2013) determine the relationship among gross national savings, gross capital formation and economic growth in Nigeria from 1975 to 2008 using co-integration test and vector error correction model. The results of the co-integration test show that there is evidence of a long run relationship among the three variables. The results of the vector error correction model indicate that economic growth has stronger influence on both gross national savings and gross capital formation than the influence of gross national savings and gross capital formation on economic growth. The results reveal that there is a bi-directional causality between economic growth and gross capital formation, economic growth and gross national savings, and gross national savings and gross capital formation in Nigeria.

Nwanne (2014) analyzes the implications of savings and investment on economic growth in Nigeria from 1981 to 2014 using ordinary least square method. The results of the unit root tests show that all the variables are integrated at order one. The results of the Johansen co-integration test show that there is a long run relationship among savings, investment and economic growth. The regression results show that gross domestic savings has significant negative effect on economic growth and gross domestic investment has significant positive effect on economic growth in Nigeria.

Odey et al. (2017) evaluate the impact of savings and investment on economic growth in Nigeria from 1970 to 2015 using co-integration test and error correction model. The results of their investigation show that gross domestic savings, gross fixed capital formation, labour force and savings facility stimulate economic growth. The results of investment model show that economic growth and gross domestic savings propel investment expenditures in Nigeria.

From empirical studies on savings, investment and economic growth nexus in Nigeria, we observe that there are gaps in the literature that need to be filled. The findings by Akinola and Omolade (2013) indicates that there is a bi-directional causality between economic growth and gross capital formation, economic growth and gross national savings, and gross national savings and gross capital formation but they could not establish the order of causality among these three economic variables. The ordinary least square method used by Nwanne (2014) and

error correction model employed by Odey et al. (2017) are not appropriate for their studies because they are not useful in dealing with multivariable causality.

To establish the order of causality among savings, investment and economic growth in Nigeria, we have to apply the classical theory, Keynesian economic theory and Harrod-Domar model to Nigerian economy. In other words, the classical theory, Keynesian economic theory and Harrod-Domar model are the theoretical framework for this study. In classical theory and Harrod-Domar model, savings Granger causes investment. In Keynesian economic theory and Harrod-Domar model, investment Granger causes economic growth. In Keynesian economic theory, economic growth Granger causes savings. Therefore, we expect that the order of causality among savings, investment and economic growth in Nigeria, run from savings to investment, investment to economic growth and economic growth to savings. The order of causality among these three economic variables is established in this paper using Vector Autoregression (VAR) model.

3. Methodology

3.1 Model Specification

This paper uses a three variable VAR approach following Attanasio et al. (2000) to establish the order of causality among savings, investment and economic growth in Nigeria. The model is summarized in the reduced-form VAR:

$$Y_i = \alpha_o + \sum_{i=1}^{n} \beta_i Y_{t-i} + u_i \quad \_\_\_(9)$$

Where Y_t is a 3*1 vector of variables (GDS, GDI, GDP); β_i are coefficient matrices of size 3×3 and u_i is the one-step ahead prediction error with variance-covariance matrix Σ , α_o is the intercept, t is time, i is the lag length, GDS is Gross Domestic Savings, GDI is Gross Domestic Investment and GDP is Gross Domestic Product- a proxy of economic growth. All variables are in normal form.

The VAR methodology deals with several endogenous variables together. Each endogenous variable is explained by its lagged, or past, values and the lagged values of all other endogenous variables in the model; usually, there are no exogenous variables in the model. Since there are three variables, the VAR technique is employed because it is very useful in dealing with multivariable causality. Forecasting is an important part of economic analysis, for some people probably the most important. Vector autoregression has become quite popular method of forecasting economic variables.

As in any standard VAR model analysis, the way the variables enter the model is extremely important for the interpretation of the results. The most appropriate ordering is: GDS – GDI – GDP. The gross domestic savings has great influence on gross domestic investment. The gross domestic investment has great influence on economic growth. The economic growth has great influence on gross domestic savings. So, GDS should come first in the VAR model.

3.2 Estimation Method

The VAR model is estimated using e-view 9. The time series properties of the data are analyzed using Augmented Dickey-Fuller (ADF) unit root test of Dickey and Fuller (1979). Test of co-integration is carried out using the Johansen (1988) maximum likelihood procedure. The lag length is determined by the likelihood ratio (LR), final prediction error (FPE), Akaike information criteria (AIC), Schwarz information criteria (SC), and Hannan-Quinn information criteria (HQ). The VAR residual portmanteau tests for autocorrelations are used to verify the assumption of no autocorrelation. The cusum test and VAR residual normality tests are used to verify whether the VAR model satisfy the stability and normality assumptions respectively.

3.3 Data

The empirical analysis is conducted using annual data. The time span covered is 1986 to 2017. The choice of 1986 as the base year is due to the fact that the policy of deregulation of Nigerian economy started that year. The choice of 2017 as the terminal year is premise on the fact that the time series data of the variables required for the study are available only up to that year. This study is confined within the period of deregulation in other to take into cognizance the classical view of a capitalist economic system. The data of gross domestic savings, gross domestic investment and gross domestic product are obtained from World Bank World Development Indicators.

4. Results

4.1 Pre-Estimation Tests

The unit root test was conducted using Augmented Dickey-Fuller (ADF) test (Table 1). All the variables are non-stationary at levels because ADF-statistic is less than test critical value in absolute term at 5 percent level and p-

value of each variable is greater than 5 percent. All the variables are stationary at first differences because ADF-statistic is greater than test critical value in absolute term at 5 percent level and p-value of each variable is less than 5 percent. The ADF test indicates that the variables are integrated at order one at 5 percent level.

Table 1. Augmented Dickey-Fuller Test

Variables	Levels		First Differences		Order of Integration
	ADF- Statistic	Prob*	ADF- Statistic	Prob*	
GDS	-1.4688	0.5348	-3.2394	0.0281	I(1)
GDI	2.1043	0.9998	-4.1438	0.0031	I(1)
GDP	-0.6879	0.8316	-9.3388	0.0000	I(1)

Test critical values: 1% level -3.6892
5% level -2.9719
10% level -2.6251

*Mackinnon (1996) one sided p-values

Source: Authors' Computation

The co-integration test was conducted using Johansen test for co-integration vectors (Table 2). The trace statistic is greater than 0.05 critical value and p-value is less than 5 percent for none hypothesized number of co-integrating equations. The max-eigen statistic is greater than 0.05 critical value and p-value is less than 5 percent for none hypothesized number of co-integrating equations. Both trace and maximum eigenvalue tests indicate 1 co-integrating equations at 5 percent level. Both trace and maximum eigenvalue tests denote rejection of no co-integration at 5 percent level.

Table 2. Johansen Test for Co-integration Vectors

Hypothesized No. of CE (s)	Trace			Maximum Eigenvalue		
	Trace Statistic	0.05 Critical Value	Prob**	Max-Eigen Statistic	0.05 Critical Value	Prob**
None*	46.6610	29.7971	0.0003	37.9688	21.1316	0.0001
At most 1	8.6922	15.4947	0.3946	8.6738	14.2646	0.3143
At most 2	0.0184	3.8415	0.8921	0.0184	3.8415	0.8921

*denotes rejection of the hypothesis at the 0.05 level

** Mackinnon- Haug- Michelis (1999) p-values

Source: Authors' Computation

The lag length selection was done using the VAR lag order selection criteria (Table 3). The sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC) and Hannan-Quinn information criterion indicate maximum lag length 2 while Schwarz information criterion indicates maximum lag length 1 at 5 percent level. Since the value of LR (23.3447) at lag 2 is the smallest out of the values indicated by these five criteria, the VAR model is estimated at a maximum lag length 2 based on sequential modified LR test statistic.

Table 3. VAR Lag Order Selection Criteria

Lag	LR	FPE	AIC	SC	HQ
0	NA	4.86E+75	182.7894	182.9295	182.8342
1	152.6315	2.51E+73	177.5189	178.0794*	177.6982
2	23.3447*	1.70E+73*	177.1039*	178.0848	177.4177*

*Indicates lag order selected by the criterion

Source: Authors' Computation

4.2 Post-Estimation Tests

The results of the VAR residual portmanteau tests for autocorrelations are presented in table 4. The computed Q-statistic at lag 3 and 9 degrees of freedom is 44.5616. The critical value of Q at 5 percent level of significance and at 9 degrees of freedom is 4.756. The computed Q-statistic is greater than the critical Q-statistic at 5 percent level of significance and at 9 degrees of freedom. Therefore, we accept the null hypothesis that there is no residual autocorrelations up to the specified number of lags.

Table 4. VAR Residual Portmanteau Tests for Autocorrelations

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	8.3886	NA*	8.6778	NA*	NA*
2	24.9808	NA*	26.4552	NA*	NA*
3	44.5616	0.0000	48.2117	0.0000	9

*The test is valid only for lags larger than the VAR lag order

df is degrees of freedom for (approximate) chi-square distribution

Source: Authors' Computation

Figure 1 presents the cusum for stability test. The cusum is used to verify whether the VAR model is stable. The VAR model is stable if the cusum lies within 5 percent critical bound dotted lines. As we can see in Figure 1, the cusum lies within 5 percent critical bound dotted lines. The cusum indicates that the VAR model is stable at 5 percent level of significance.

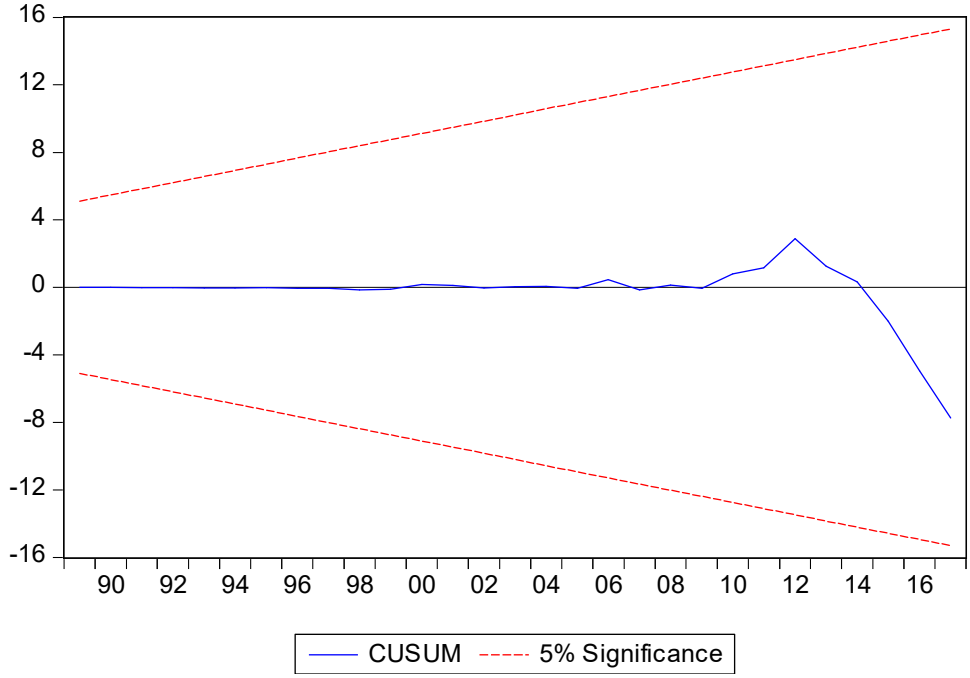


Figure 1. Cusum Test

The results of the VAR residual normality tests are shown in table 5. Instead of going for any rule of thumb for the acceptable ranges of skewness and kurtosis for normal distribution of data, we check Jarque-Bera test. This is because Jarque-Bera test is based on skewness and Kurtosis and so the acceptance of the null hypothesis in this test means that skewness and kurtosis are within the acceptable ranges for normality, and the rejection of the null hypothesis in this test means that skewness and kurtosis are not in acceptable ranges for normality of the data. The Jarque-Bera (JB) statistic is 92.3266 and the computed p-value is zero percent. The computed p-value of JB statistic is too low which indicates that the value of the JB statistic is very different from zero. Therefore, we reject the null hypothesis that the residuals are multivariate normal.

Table 5. VAR Residual Normality Tests

Component	Jarque-Bera	df	Prof.
1	83.5378	2	0.0000
2	3.1157	2	0.2106
3	5.6731	2	0.0586
Joint	92.3266	6	0.0000

Source: Authors' Computation

4.3 Impulse Response Analysis

Figure 2 (a) presents the response of Gross Domestic Investment (GDI) to Gross Domestic Savings (GDS). The response of GDI to GDS ranges from 1.16E+12 to 9.21E+11 during the period under investigation. The response of GDI to GDS is positive. The GDS has significant positive impact on GDI. Sims (1987) suggests that for impulse responses, significance can be crudely gauged by the degree to which the functions are bounded away from zero. The finding that GDS has significant positive impact on GDI is in line with the classical theory and Harrod-Domar model that savings has a strong positive influence on investment.

Figure 2 (b) shows the response of Gross Domestic Product (GDP) to GDI. The response of GDP to GDI ranges from 1.04E+12 to 9.92E+11 during the period under review. This result indicates that GDI has significant positive impact on GDP. This finding conforms to the Keynesian economic theory and Harrod-Domar model that investment has a strong positive impact on economic growth.

Figure 2 (c) reveals the response of GDS to GDP. The response of GDS to GDP ranges from 1.18E+11 to 5.16E+11 during the period under study. This result shows that GDP has insignificant positive impact on GDS. This finding tally with the Keynesian economic theory because even though Keynes believe that savings is an increasing function of income, he identifies the non-interest rate motives for savings and these non-interest rate motives for savings generate savings regardless of the level of income. The results of the impulse response

functions reveal that the order of causality among GDS, GDI and GDP in Nigeria, runs from GDS to GDI, GDI to GDP and GDP to GDS.

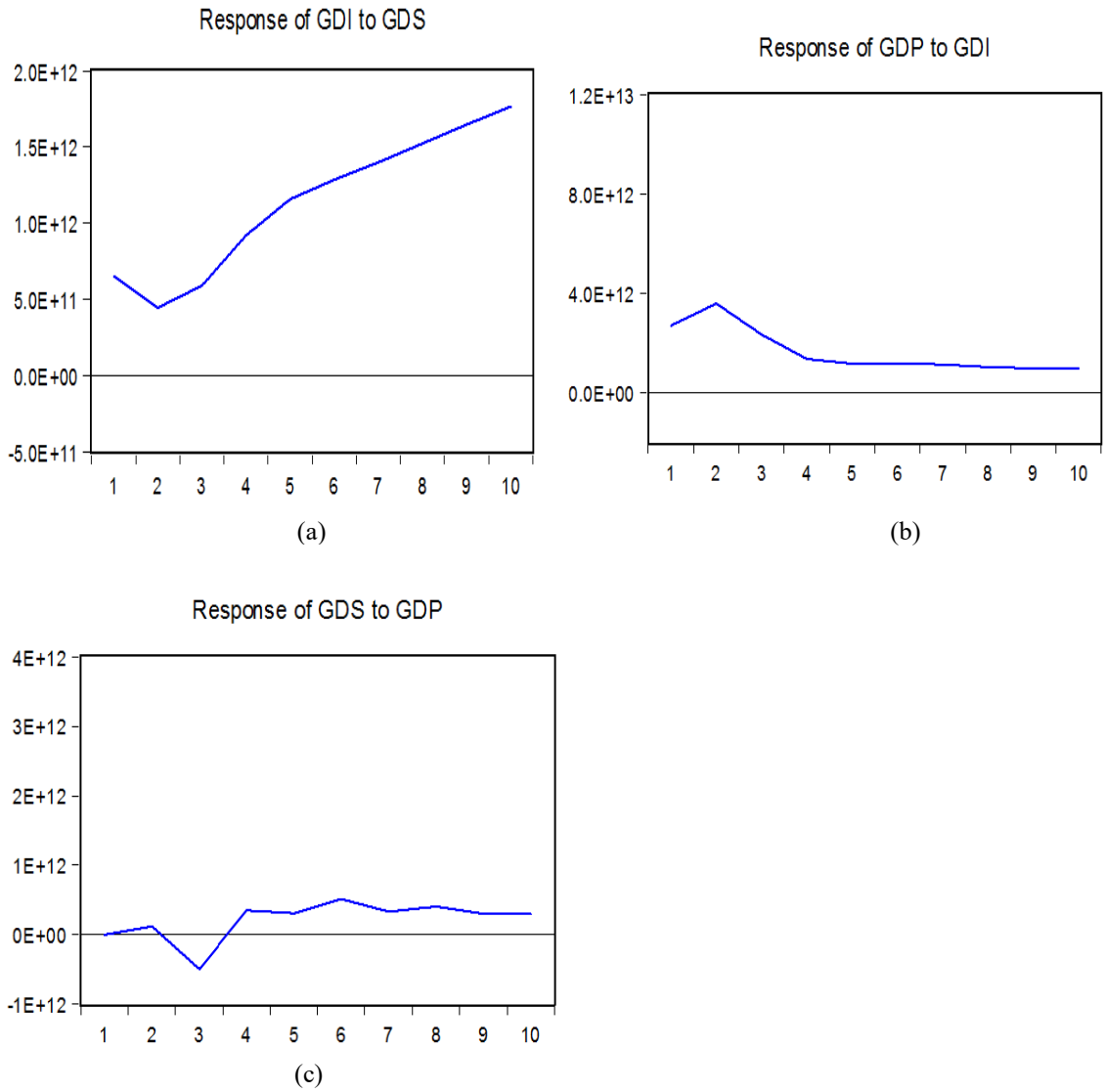


Figure 2. Response to Cholesky One S. D. Innovations

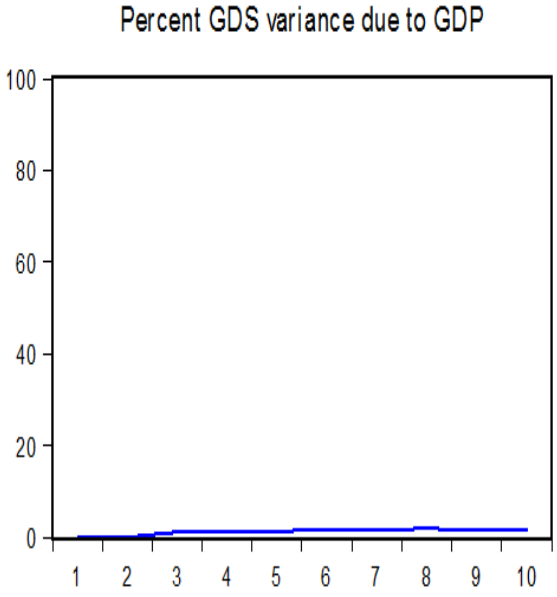
4.4 Variance Decomposition

Figure 3 (a) presents the variance decomposition of GDI to GDS. The variance decomposition of GDI to GDS ranges from 30.4257 percent to 80.9637 percent during the period under investigation. On average, the variance decomposition of GDI to GDS is 60.15 percent. This result indicates that GDS has a significant positive impact on GDI. Runkle (1987) suggests a probability range above 10 percent for significance in variance decomposition. This finding shows that GDS contributes 60.15 percent to variation of GDI during the period under review.

Figure 3 (b) shows the variance decomposition of GDP to GDI. The variance decomposition of GDP to GDI ranges from 5.3413 percent to 42.4257 percent during the period under study. On average, the variance decomposition of GDP to GDI is 20.09 percent. This result shows that GDI has a significant positive impact on GDP. This finding implies that GDI contributes 20.09 percent to variation of GDP during the period under review.

Figure 3 (c) reveals the variance decomposition of GDS to GDP. The variance decomposition of GDS to GDP ranges from zero percent to 1.8899 percent during the period under review. On average, the variance decomposition of GDS to GDP is 1.34 percent. This result shows that GDP has insignificant positive impact on GDS. This finding indicates that GDP contributes 1.34 percent to variation of GDS during the period under investigation. The results of the variance decomposition also reveal that the order of causality among GDS, GDI and GDP in Nigeria, runs from GDS to GDI, GDI to GDP and GDP to GDS.

(a) (b)



(c)

Figure 3. Variance Decomposition

5. Conclusions

Based on the results of the investigation, the following conclusions are drawn. The gross domestic savings has significant positive impact on gross domestic investment. The gross domestic investment has significant positive impact on gross domestic product. The gross domestic product has insignificant positive impact on gross domestic savings. The order of causality among gross domestic savings, gross domestic investment and gross domestic product in Nigeria, runs from gross domestic savings to gross domestic investment, gross domestic investment to gross domestic product and gross domestic product to gross domestic savings. There would be steady growth of output if adequate savings are mobilized for investment expenditures in Nigeria. To mobilize adequate savings for investment, there must be an increase in interest rate because interest rate is an incentive for people to save. However, the order of causality among savings, interest rate and investment has not been established in this paper. Further studies should establish the order of causality among savings, interest rate and investment in Nigeria.

References

Akinola, G. W. & Omolade, A. (2013), "Savings, Gross Capital Formation and Economic Growth Nexus in Nigeria (1975-2008)", *IOSR Journal of Economics and Finance* 1(2), 19-25.

Amacher, R. C. & Ulbrich, H. H. (1986), "*Principles of Macroeconomics",* South-Western Publishing Co, Cincinnati, Ohio.

Attanasio, O. P., Picci, L. & Scorcu, A. E. (2000), "Saving, Growth, and Investment: A Macroeconomic Analysis Using a Panel of Countries", *The Review of Economics and Statistics* 82(2), 182-211.

Budha B. (2012), "A Multivariate Analysis of Savings, Investment and Growth in Nepal", *MPRA Paper* No. 43346 [Available online at http://mpra.ub.uni-muenchen.de/43346/].

Dickey, D. A. and Fuller, W. A. (1979), "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association* 74, 427-431.

Domar, E. D. (1946), "Capital Expansion, Rate of Growth, and Employment", *Econometrica* 14.

Harrod, R. F. (1939), "An Essay in Dynamic Theory", *The Economic Journal* 49(193), 14– 33, JSTOR 2225181.

Hundie, S. K. (2014), "Savings, Investment and Economic Growth in Ethiopia: Evidence from ARDL approach to co-integration and TYDL Granger-causality tests", *Journal of Economics and International Finance* 6(10), 232-248.

Johansen, S. (1988), "Statistical Analysis of Co-integrating Vectors", Journal of Economic Dynamics and Control 12, 231-54.

Keynes, J. M. (1936), "*The General Theory of Employment, Interest and Money",* Harcourt, Brace and Co, New York.

Mohamed, S. A. E. (2014), "Testing the Relationship between Private Savings and Economic Growth in Bahrain", *Global Journal of Commerce and Management Perspective* 4(6), 1-6.

Nwanne, T. F. I. (2014), "Implication of Savings and Investment on Economic Growth in Nigeria", *International Journal of Small Business and Entrepreneurship Research* 2 (4), 74-86.

Odey, F. I., Effiong, C. E. & Nwafor, J. U. (2017), "Savings-Investment and Economic Growth Nexus in Nigeria", *International Journal of Development and Economic Sustainability* 5(7), 1-14.

Ramesh J. (2011), "Causal Relationship between Saving, Investment and Economic Growth for India – What does the Relation Imply?", *Reserve Bank of India Occasional Papers 32* (1).

Runkle, D. E. (1987), "Vector Autoregressions and Reality", *Journal of Business and Economic Statistics* 5(4), 437-442.

Ruranga, C., Ocaya, B. & Kaberuka, W. (2014), "VAR Analysis of Economic Growth, Domestic Investment, Foreign Direct Investment, Domestic Savings and Trade in Rwanda", *Greener Journal of Economics and Accountancy* 3(2), 030-041.

Say, J. B. (1830), "*A Treatise on Political Economy",* John Grigg, Philadel-phia.

Sims, C. (1987), "Bayesian Skepticism on Unit Root Econometrics", *Journal of Economic Dynamics and Control* 12, 463-474.

Verma, R. (2007), "Savings, Investment and Growth in India: An Application of the ARDL Bounds Testing Approach", *South Asia Economic Journal 8*(1), 87-98.

Verma, R. & Wilson, E. (2005), "Savings, Investment, Foreign Inflows and Economic of the Indian Economy 1950-2001", *Economics Working Paper Series,* University of Wollongong.