The Nexus Between Domestic Saving and Economic Growth

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Abstract

This study attempts to examine the nexus between domestic saving and economic growth in Nigeria from 1981 to 2018. The study employed annual time series data from the Central Bank of Nigeria's statistical bulletin. The variables understudy (domestic saving, government capital formation, inflation, interest rate and economic growth) were subjected to stationarity test using Augmented Dickey Fuller test (ADF). Johansen co-integration test was employed to test for long-run equilibrium relationship among the variables. While Vector error correction model was employed for the analyses of short run dynamic relationship among the variables. The ADF test revealed that all the variables are stationary at first difference. The Johansen co-integration test reveals long-run equilibrium relationship among the variables. Also, the long-run co-integrating vector result is similar to the dynamic short-run vector error correction model result. Findings reveal that domestic saving and inflation have negative relationship with economic growth while interest rate and government capital formation have positive relationship with economic growth. The error correction term is -0.010370. The study recommended that government should encourage production of goods and services because increase in the output level can reduce inflation to the required minimum level. Government should embark on suitable interest rate policies that will augment the economy. Government capital formation should be encouraged as it translates to investments that are capable of boosting the economy.

Keywords: Domestic Saving, Economic Growth, Johansen Co-integration and Vector Error Correction Model.

Introduction

Achieving sustainable economic growth is one of the main aims of macroeconomic policies. The interactions between economic growth and other macroeconomic variables are very important to determine the policies which lead to economic growth. The theoretical studies on the relationship between economic growth and savings dated back to the works of Harrod (1939) and Domar (1946) who in their model stated that economic growth depends on saving rate and higher saving rate will lead to higher rates of economic

growth. In their works, Solow (1956) and Swan (1956) opine that saving rate also has effect on economic growth in the neoclassical growth model and changes in saving rates affect economic growth. Moreover, saving rate is accepted as one of the key determinants of economic growth in the endogenous growth theory whose pioneer studies are Romer (1986), Lucas (1988) and Robelo (1991). It is predicted that an increase in the saving rate will lead to a permanently higher growth rate in line with the endogenous growth theory. Promoting domestic saving in Nigeria, a country where 40.1% of its population are poor is difficult (National Bureau of Statistics, 2019). The country is yet to utilize the abundant natural resources and is still focusing on crude oil as its main source of revenue. Government has to increase its sources of revenue which will help it invest in the required sectors and save a lot for the unplanned events like pandemic (covid-19), drought, famine, war etcetera. The citizens of a country will suffer a lot when the economy is halted for long and the boarders are closed when it refused to save domestically. However, to empirically determine the relationship between saving and economic growth, (whether it is vital for economic growth or not) this study is necessary. This study seeks to investigate the nexus between domestic saving and economic growth utilizing vector auto regressive model and Johansen co-integration for the analysis of data.

Research Question

In view of the above, the study seeks to answer the research question which states that "is there a short run and long run equilibrium relationship between saving, inflation, interest rate, government capital formation and economic growth in Nigeria?"

Objective of the Study

The main objective of the study is to examine the short-run and the long-run relationship between domestic saving, inflation, interest rate, government capital formation and economic growth in Nigeria.

Hypothesis of the study:

To achieve the objective of the study and to answer the research question, the null hypothesis is formulated and stated as thus;

Ho: There is no short run and long run relationship between domestic saving, inflation, interest rate and government capital formation on economic growth in Nigeria.

Literature Review

The Solow-Swan Growth Model: The relationship between domestic saving and economic growth is explained in details in **Solow's growth model (1956)**. The growth

model shows the relationship between savings and economic growth. Alguacil, Cuadros and Orts (2004) noted that this model states higher savings help to contribute to the growth of the economy. Countries should create their policies to encourage savings in order to increase income. In addition, Alguacil *et al* (2004) stated that higher saving level causes capital accumulation and capital accumulation increases gross domestic product (GDP).

The Harrod-Domar Model: As explained by Jhingan (2012), the model shows not only the rate at which the economy must grow if it is to make use of the capacity created by new investment but inversely, the required savings and capital-output ratios if income is to attain a certain growth rate.

Empirical Review

In an attempt to determine the relationship between saving and economic growth, Basabose (2020) examines the relationship between gross domestic savings, exports of goods and services, foreign direct investment, population growth rate, final expenditure, and gross domestic income in Rwanda for the period that stretches from 1988-2018. Employing VECM model, the finding revealed that there is a positive significant relationship between gross domestic product, exports, and foreign direct investment and gross domestic savings, but final expenditure and the population growth affect the domestic savings negatively. On the other hand, in the short-run, the exports of goods and services affect domestic savings positively whereas income affects the domestic savings negatively but significantly. However, the study is conducted in Rwanda and not Nigeria.

On the contrary, Chuba and Egbotomhen (2019) determined the effect of gross domestic savings on economic growth in Nigeria from 1986 to 2019 using the Error Correction Model (ECM). All the variables except net export have significant positive impact on gross domestic product, a proxy of economic growth. The net export has insignificant negative impact on economic growth. The regression coefficient of ECM is negative and it is statistically significant at 5 percent level. However, using VAR model, it can be difficult to estimate for complex situations, since they use little economic theory.

On the Contrary, Josh, Pradhan and Bist (2019) analyzed the relationship between savings, investment, and economic growth in Nepal over 1975 to 2016. The structural breaks in the variables have been accounted for using the unit root test along with co-integration approach. The ARDL approach to co-integration in the presence of structural breaks has also been utilized to analyze the long-and short-run dynamics of savings, investment, and growth in Nepal. The results show structural breaks in the real GDP per capita during 2001 when the Royal Massacre and a state of emergency have taken place in Nepal. After

allowing for this structural break, evidence of a co-integration relationship amongst savings, investment, and economic growth was identified. The estimates of the ARDL approach suggest that investment has a significant and positive impact on economic growth. However, gross domestic savings have a negative impact on growth in the long run. These results clearly show weaknesses of the economy in mobilizing savings into productive sectors. The distributed lag models can be problematic when the lag length is long, especially in small samples.

In Addition, Gocer (2019) investigated the determinants of domestic savings rate in Turkey by employing Dynamic Ordinary Least Square method for 1975-2018 periods. The result reveals that no causal relationship from real interests and gold prices to savings is determined, permanent causality from national income and employment to savings and temporary causality from inflation to savings is found. However, the study is conducted in a country with no peculiarity with Nigeria.

However, Khan, Teng, Reham and Abasimi (2018) investigated determinants of gross domestic saving of eighteen Asian countries. Fixed effect model was employed in the study. The results revealed that gross domestic product, age dependency ratio, broad money and inflation have statistically significant effect on the gross domestic savings while tax revenue have non-significant effect on gross domestic saving. Gross domestic product, broad money and tax revenue have positive effect on gross domestic saving while age dependency ratio and inflation have negative effect on gross domestic saving. Notwithstanding, the research is done in a country that does not share same characteristics with Nigeria.

Differently, Egoro and Obah (2017) analyzed the impact of national savings on economic growth in Nigeria (1990-2015). Using Ordinary Least Square, result shows that there is a positive and significant relationship between domestic savings and gross domestic product in Nigeria. However, OLS technique is responsive to outliers and the test statistics might be unreliable when the data is not normally distributed. There is also the tendency to over fit the model. Added to that, the research is done in a country that does not share same characteristics with Nigeria.

In India, Patra, Murthy, Kuruva and Mohanty (2017) analyzed the long run association between savings and economic growth in India for the period 1950 to 2012.The study identified the structural break in the year 1980 by employing Bi-Perron test with unknown time. The study reveals that savings boost the real activity both in the pre and post break period in the long-run, while economic growth causes saving in the short-run in the pre

break period. Notwithstanding, the research is done in a country that does not share same characteristics with Nigeria.

In a different manner, Sunday (2017) investigated the impact of domestic savings on the economic growth of Nigeria from 1980 to 2013. The study adopts Johansen co-integration, granger causality test and Error Correction Model. The co-integration test reveals the presence of long run relationship among the variables while the granger causality test shows that both domestic savings and real gross domestic product granger cause each other. Also, ECM result shows that domestic savings has positive impact on economic growth.

Comparatively, Jagadeesh (2015) investigated the role of savings in economic growth in Botswana. The study adopted Auto Regressive Distributed Lagged (ARDL) model using Botswana's time series data for the period of 1980 to 2013. The test found out that there is significant relationship between Savings and Economic growth.

Distinctively, Hishongwa (2015) analysed the dynamic relationship between domestic savings, investment and economic growth in Namibia, and ascertain the direction of causality between domestic savings, investment and economic growth, using the vector auto-regression methodology. The findings of the study reveal that shocks to savings affect savings, investment and economic growth positively and significantly. In addition, shocks to investment significantly affect investment and savings in the short run, but they are insignificant in explaining economic growth. Further, shocks to economic growth significantly influence savings, investment and economic growth.

In a different manner, Sothan (2014) determined the direction of causality between domestic saving and economic growth in Cambodia, from the period 1989–2012. Using Granger Causality Test, the study found that domestic saving does not Granger cause economic growth in Cambodia. But notwithstanding, granger causality technique cannot reveal directed causal influence from time series to the other one among three-time series.

On the contrast, Najarzadeh, Reed and Tasan (2014) assessed the relationship between savings and non-oil economic growth for Iran. Using annual data for the period 1972-2010, the research adopted Autoregressive Distributed Lag Model. The results of the study show that there is a positive and significant impact of savings on total and non-oil economic growth. Both types of economic growth are also found to have positive and significant effect on savings. In addition, the results show that there is a long-run causal relationship between savings and economic growth, and between saving and non-oil economic growth, and that these relations are two-way. However, the study is not conducted in a country with similar characteristics as Nigeria.

On the opposite, Bayar (2014) examined the effects of domestic savings and foreign direct investment inflows on the economic growth in emerging Asian economies during the period 1982-2012 by using Pedroni, Kao and Johansen-Fisher panel co-integration tests and vector error correction model. The result reveals that gross domestic savings, gross domestic investment and foreign direct investment inflows had positive effect on economic growth in the long run. However, using VAR model, it can be difficult to estimate for complex situations, since they use little economic theory.

In a different direction, El-Seoud (2014) investigated the long run and short run relationships between private savings and economic growth in Bahrain. The study methodology is based on the econometrics analytical approach to estimate the parameters' value and the trends of the economic relations between the study variables by using the co-integration and Granger causality techniques. Johansen co-integration test indicates that a positive long run relationship between the study variables, while Granger causality test reveals that significant bilateral causality between the private savings and the economic growth, this means that the economic growth Granger causes the private saving, and also the private savings Granger cause the economic growth. These results indicate that the economic growth could stimulate the private saving, and the private savings could accelerate the economic growth in the long run.

Comparatively, Ayalew (2013) investigated the determinants of domestic saving in Ethiopia using time series annual data from 1970 to 2011. Using an ARDL bounds testing Approach and Error correction model (ECM) to capture short run and long run relationships, the estimated results revealed that growth rate of income, budget deficit ratio and inflation rate were statistically significant short run and long run determinants of domestic saving in Ethiopia. But, depositing interest rate, current account deficit ratio and financial depth were found to be statistically insignificant determinants in the long run. The speed of adjustment has value 0.63768 with negative sign, which showed the convergence of saving model towards long run equilibrium. However, the distributed lag models can be problematic when the lag length is long, especially in small samples.

However, Basnet (2013) examined the role of foreign aid on domestic savings and economic growth in South Asian countries (Bangladesh, India, Nepal, Pakistan, and Sri-Lanka) by using simultaneous equation system in which growth and savings are jointly determined. The results indicate that foreign aid has a positive and significant effect on the growth rates while domestic saving has a negative effect on growth rates of the five nations studied during 1960 to 2008. However, the country in which the research was conducted does not share same peculiarities with Nigeria.

Materials and Methods

The data used in the study was obtained from the Central Bank of Nigeria statistical bulletin for the periods between 1981 and 2018.

Model Specification

Johansen Co-integration

Co-integration test is vital in determining whether the variables in a model are co-integrating or not. According to Gujarati, Porter and Gunasekar (2012), variables are co-integrated if there exists a long-term relationship among them. It is an econometric technique use for testing the non- stationarity of time series variables. The existence of co-integration relates to the existence of long run equilibrium relationship among a set of non-stationary variables.

The co- integration model can be specified as:

$$Y_t = A_t Y_{t-1} + \cdots + A_{t-n} + By + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where;

Y_t = dimensional vector of non-stationarity
$\gamma = \gamma$ – dimensional vector of deterministic variable
e_t = stochastic error residual

When a unit root exists in the series, the best approach is to use the Johansen test. If the variables are co-integrated, this means there exist long-run relationship among the variables. In this case, Vector Error Correction Model is necessary.

Vector Error Correction Model

The study employed the VECM model. The reason for applying the VECM is to explain the speed of adjustment. As opined by Gujarati et al (2012), the VECM has co-integration relation built into the model so that it restricts the long-term behavior of the endogenous variables to converge to their co-integrating relationship while allowing for short term dynamics adjustments.

The conditional VECM can be specified as follows:

$$\Delta lnGDP_t = \alpha_i + \Delta lnGDP_{t-1} + \Delta lnDS_{t-1} + \Delta lnCPI_{t-1} + \Delta lnINTR_{t-1} + \Delta lnGCF_{t-1} + \lambda_i ECM_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where:

GDP= Gross Domestic Product (Proxied as economic growth)
DS= Domestic Saving
CPI=Consumer Price Index (proxied as Inflation)
INTR= Interest rates
GCF= Government Capital Formation
Δ= Difference operator
α_i= constant or the intercept
λ= speed of adjustment with a negative sign.
μ_t= residuals (stochastic error term)
ln= Natural logarithm (LOG)

Result of the Findings

Unit Root Test

It is very important to test whether the time series data are stationary or otherwise. Augmented Dickey-Fuller (ADF) test was used to find the order of integration. This test showed how many times a variable need to be differenced to become stationary.

Table 1: Unit root test results from Augmented Dickey Fuller Test at first difference

Variables	ADF at 1st Difference	Critical value at 5%	Order of integration
Ln GDP	--3.180464	-2.945842	I(1)
LnDS	-9.266864	-1.950394	I(1)
Ln CPI	-3.505344	-2.948404	I(1)
LnINTR	-7.433496	-3.540328	I(1)
LnGCF	-3.613335	-2.951125	1(1)

Source: Authors' computation from Eviews 9

Decision rule:

If t* > ADF critical value = do not reject null hypothesis, i.e., unit root exists.
If t* < ADF critical value = reject null hypothesis, i.e., unit root does not exist.
The unit root/stationary test result in Table1 reveals that the variables are 1(1). They are non-stationary at the levels but become stationary after the first difference. Since t* < ADF critical value, it is therefore necessary to conclude that all the series are integrated of the first order 1(1).
This outcome suggests the need for co-integrated test to know whether there exist long-run relationships among the variables.

Test Result for Co-integration ranks

Table 2(a): Unrestricted Co-integration Rank Test (Trace Statistics)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.661704	85.06420	69.81889	0.0019
At most 1	0.491179	46.04618	47.85613	0.0732
At most 2	0.316781	21.72245	29.79707	0.3142
At most 3	0.180555	8.008608	15.49471	0.4645
At most 4	0.023064	0.840016	3.841466	0.3594

Source: Authors' computation from Eviews 9

Table 2(b): Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.661704	39.01802	33.87687	0.0111
At most 1	0.491179	24.32373	27.58434	0.1238
At most 2	0.316781	13.71384	21.13162	0.3890
At most 3	0.180555	7.168592	14.26460	0.4694
At most 4	0.023064	0.840016	3.841466	0.3594

Source: Authors' computation from Eviews 9

Tables 2(a) and 2(b) present Trace Statistics and the Maximum Eigenvalue respectively; the tables indicate the presence of one co-integrating equilibrium relationship among the variables under study. This necessitates the use of Vector Error Correction Model, to know the speed of adjustment from short run to long run.

Table 3: The estimated long run co-integration vector with GDP as dependent variable

Variable	Coefficients	T- statistics
LnDS	-1.358411	-6.49693
LnCPI	-1.271170	-31.7879
LnINTR	0.331690	1.19852
LnGCF	1.302180	4.65449

Source: Authors' computation from Eviews 9

The estimated long run co-integration vector is reported in Table 3 reveals that domestic saving and inflation have negative relationship with GDP (economic growth) while Interest rate and Government Capital Formation have positive relationship with economic growth. This suggests that a percentage increase in Domestic Saving decreases economic growth

by 1.36%. This contradicts the study conducted by Sunday (2017), Hishongwa (2015), and Patra, Murthy, Kuruva and Mohanty (2017). This also contradicts Solow-Swan's growth model. The reason for this result could be because the domestic savings are not channel in the right direction. Funds saved are supposed to provide more investment which will result in increase in standard of living and income of the populace. This will augment the GDP (economic growth) of the nation.

In a similar manner, a percentage increase in inflation will decrease GDP by 1.27% in the long run. This finding supports the monetarist view that Inflation is harmful to economic growth. However, this contradicts the study conducted by Ayalew (2013).

On the contrary, a percentage increase in interest rates will increase GDP by about 0.33%. This suggests that interest rate is vital for economic growth. In the same direction, a percentage increase in Government capital formation will increase GDP by about 1.31%. This is in agreement with the study conducted by Hishongwa (2015). This is because interest rate brings in more investors and more investments translate to more production, which will in turn results to more income and increase in standard of living and this will no doubt leads to more economic growth (GDP).

Table 4: Short-run dynamic Vector Error Correction Model

Variable	Coefficients	T- statistics	T- tabulated at 5%
ECM	-0.010370	-0.32877	1.697
LnDS	-0.006708	-0.20947	1.697
LnCPI	0.233257	1.22440	1.697
LnINTR	-0.061643	-0.89233	1.697
LnGCF	0.016077	0.21559	1.697

Source: Authors' computation from Eviews 9

Note:

The T-tabulated from table 4 is gotten by knowing the degree of freedom (df) from the formula N-K………………3

Where N; stands for number of observations and K; stands for number of variables in the study. Therefore, df= 38-5 = 33. The value of the degree freedom is gotten from the statistical table obtained from Basic Econometric by Gujurati *et al* (2012). The T- tabulated at 5% is 1.697. Therefore, from the results of table 4 presented, the variables understudy is statistically insignificant at short-run. The decision rule is that:

If T-Calculated > T- Tabulated, reject null hypotheses.

If T-Calculated < T- Tabulated, accept null hypotheses. Therefore, for all the variables, the null hypothesis is accepted because their T- Calculated is less than T- Tabulated.

The result of the short –run coefficient of vector error correction model presented in Table 4 shows that domestic saving and interest rate have negative relationship with GDP. While inflation and government capital formation have positive relationship with GDP.

The error correction term is -0.010370. This means that the previous deviation from long-run equilibrium is corrected in the period at an adjustment speed of 10.3%. This means that the deviation from equilibrium in the short run is adjusted in the long run at an adjustment speed of 10.3%.

Diagnostic tests results

To check if the model used in this study was in agreement with the data, some diagnostic tests were performed and which include serial correlation LM test, Arch heteroscedasticity, normality test and CUSUM stability test. Conducting diagnostic tests was very crucial in the analysis since it revealed whether there existed a problem in the estimation of a model or not. For this study, the diagnostic tests carried out showed the following results as indicated in table 5.

Table 5: **Post Estimation / Diagnostic test result**

TEST	NULL HYPOTHESES	CHI-SQUARE	P-VALUE	REMARKS
Residual Heteroskedasticity	No Serial Correlation	**438.6001**	**0.1205**	Accept null hypothesis
White Heteroskedasticity	No Heteroskedasticity	**207.3068**	**0.0797**	Accept null hypothesis
Normality Test	Residuals are multivariate normal	**15.92174**	**0.1019**	Accept null Hypothesis

 Source: Authors' Computation from Eviews 9

Results from table 5 indicate that there is no serial correlation and the residual is homoscedastic. Similarly, our residuals are multivariate normally distributed. Therefore, the results obtained are valid for policy analysis.

Conclusion

This study has examined the nexus between domestic saving and economic growth. The short-run and the long-run relationship between domestic saving and economic growth were examined using annual time series data from 1981 to 2018. The findings of the study revealed that domestic saving and inflation have negative relationship with economic growth while interest rate and government capital formation have positive relationship with

economic growth. The error correction term is -0.010370. Based on the findings, the study concluded that domestic saving and inflation are negatively related to economic growth while interest rates and government capital formation are positively related to economic growth.

Recommendations

Based on the findings of the study, the following recommendations were made:

i.   Government should encourage production of goods and services because increase in the output level can reduce inflation to the required minimum level.

ii.   Government should embark on suitable interest rate policies that will augment the economy.

iii.   Government capital formation should be encouraged as it translates to investments that are capable of boosting the economy.

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