Savings and Economic Growth Nexus: Evidence from Nigeria

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Abstract

This study examined the causal relationship between domestic private savings and economic growth in Nigeria for the period of 1980 to 2013. The study employed the augmented Granger causality test approach developed by Toda and Yamamoto (1995). The result showed a strong unidirectional causality from domestic private savings to economic growth in Nigeria. The result supported the Solow's hypothesis. Also the evidence from Johansen co-integration result indicated that there is a positive long run relationship between domestic savings and economic growth. In view of the findings, appropriate policies mix that will enhance domestic savings in the country should be pursued.

Keywords: Domestic private savings, Economic growth, Toda and Yamamoto causality

1. Introduction

The main aim of this paper is to examine the relationship between domestic savings and economic growth in Nigeria. The rate of growth in any economy depends on the level of investment made in different sectors of that economy, and there cannot be any meaningful investment without savings. However, when savings increases, investment will also increase, and the increase in investment will result to growth in the economy. In Nigeria, the rate of aggregate investment is often higher than that of domestic savings due to the presence of foreign investment flows in the economy. These flows are not part of the domestic savings but an investment from foreign savings which in no little measure contributes to the growth of the domestic economy. Different authors have examined savings-growth relationship but there has not been a conclusive agreement between them as to whether it is savings that leads to economic growth or whether it is the growth in economy that causes the change in the rate of savings.

The relationship between savings and economic growth is not only an important but also a controversial issue for both academicians and policy makers. Many internationally reputed economists have analyzed this phenomenon as cause and effect relationship. A group of economist's favours capital fundamentalist's point of view but others are in favour of Keynesian theory (Sajid and Sarfraz 2008). The capital fundamentalist's assumes that increased savings stimulate economic growth through increased investment. This view is supported by Harrod (1939), Domar (1946) and Solow (1956) growth models. Also results of empirical research by Bebczuk (2000), Alguacil, Cuadros and Orts (2004) as well as by Singh (2009) provide support for the hypothesis that increased savings promote economic growth. The theories of economic growth stipulate that the dynamics of the country's economic growth increases if the investment in human or material capital or in scientific research and development (R&D) grows. However, if the country has access to international financial markets, it may not necessarily develop faster due to domestic savings, as investment may be financed with foreign savings (Guterries, Solimano, 2007). The Keynesian theory, on the other hand, has it that economic growth stimulates increased savings. This approach is backed up by the Keynes model (1936). Moreover, the results of empirical research carried out by Sinh and Sinh (1998), Saltz (1999), Agrawal (2001), Anoruo and Ahmad (2001), Narayan and Narayan (2006) and Abu (2010) confirm this Keynesian postulation.

Meanwhile, it is important to note from the foregoing that there is divergence in the perception and empirical findings among writers from different economic environment (developed, developing, and underdeveloped economies) over this subject matter. There is need to investigate the direction of causality between domestic savings and economic growth in Nigeria and this is what this paper intends to achieve. This work is organized as follows: after this brief introduction, section 2 will review the related literature both theoretically and empirically, section 3 will present the methodology for the study, while section 4 will contain the empirical results of the findings. Finally, Section 5 provides the conclusion and policy recommendation.

2.0 Literature Review

Over the years effort has been made by several writers to estimate the dynamics of relationship between savings and economic growth both in Nigeria and in other countries. In this section we will review some of these findings. Vaibhav, Brajesh and Dholakia (2008) in their study examined the inter- relationship between economic

growth, saving rate and inflation for south-east and south Asia in a simultaneous equation framework using two stage least squares with panel data. The relationship between saving rate and growth was found to be bi-directional and positive. Inflation has a highly significant negative effect on growth but positive effect on saving rate. Inflation is not affected by growth but is largely determined by its past values, and saving rate is not affected by interest rate. Mohan (2006), using the Granger causality test, analyzed the relationship between economic growth and savings in four groups of countries with various levels of economic development in the 1960-2001 period. The results of this research turned out to be ambiguous and revealed that in 13 of the analyzed countries economic growth was the cause of increased savings in Granger sense. The opposite results, pointing at savings being the cause of economic growth, were obtained in two countries. Also in other two countries no causal relationship between savings and economic growth was observed. In five countries, however, the scientist confirmed the existence of a two-way relationship between economic growth and savings. We can also observe the growing importance of the research on the relationship between savings and economic growth using the co-integration techniques.

Saltz (1999) using the model of vector error correction (VEC) and the model of vector auto regression (VAR) analyzed the relation between savings and economic growth in seventeen countries from all over the world. The results of the analysis indicated that in nine of the analyzed countries economic growth was the cause of increased domestic savings. In two countries the opposite relation was noticed, while in three other countries no causal relation between economic growth and domestic savings was identified. Finally, in two countries, the existence of a two-way causal relation between analyzed variables was confirmed.

Misztal1 (2011) analyzed the cause and effect relationship between economic growth and savings in advanced economies and in emerging and developing countries2. Employing co-integration models and Granger's causality test in estimating the relationship, the results confirmed the existence of one-way casual relationship between gross domestic savings and gross domestic product in the case of developed countries as well as in developing and transition countries. At the same time it revealed the absence of causal relationship between gross domestic product and gross domestic savings both in developed economies and developing and transition countries. Anderson (1999) conducted a study to investigate the causal relationship between real output and savings for Sweden, UK and USA. The results indicated mutual long run relationship between variables only for Sweden and UK. The result also indicated short run bidirectional causality for USA and unidirectional causality from saving to output for UK. No significant evidence of short run causality was found for Sweden. He concluded that the causal chain linking savings and output might differ across the countries. He also suggested that causality in the long run might go in different directions than causality associated with short-term disturbances.

Sajid and Sarfraz (2008), employed co-integration and the vector error correction techniques using quarterly data for the period of 1973:1 to 2003:4. to investigate the causal relationship between savings and output in Pakistan. Their results suggest bi-directional or mutual long run relationship between savings and output level. However, there is unidirectional long run causality from public savings to output (GNP and GDP), and private savings to gross national product (GNP). The results also indicate that the speed of adjustment in case of savings is stronger than that of level of output. Implying that the overall long run results of the study favour the capital fundamentalist's point of view that savings precede the level of output in case of Pakistan. The short run mutual relationship exists between gross domestic product (GDP) and domestic savings. The results also indicate unidirectional short run causality from gross national product (GNP) to national and domestic savings; and from gross domestic product (GDP) to public savings. The short run causality runs only from national savings to gross domestic product (GDP). So the concluded that the overall short run results favour Keynesian point of view that savings depend upon level of output.

Saltz (1999) investigated the direction of causality between savings and growth rate of real GDP for 18 Latin American and newly industrialized countries for the period of 1960-1991. The results lent for greater support for the hypothesis that faster growth rate of real GDP caused higher growth rate of savings. Podrecca and Cormecci (1999) found that investment shares Granger caused growth rates and at the same time growth rates Granger caused investment shares. The Granger causality from investment shares to growth rates was found to be negative. Anoruo and Ahmad (2001) analyzed the causal relationship between the growth of domestic savings and economic growth for a sample that consist seven African economies (Congo, Cote d'Ivoire, Ghana, Kenya, Nigeria, South Africa and Zambia). The econometric results illustrated that economic growth Granger-causes the growth rate of domestic savings for all the countries except Congo where reverse causality was found. In addition, the authors discovered a feedback causal relation for Cote d'Ivoire and South Africa.

Agarwal (2001) investigated the causality between gross domestic product (GDP) and saving for a sample consisting Asian economies. The author discovered that, in most economies causality runs from GDP to saving. In Mexico, Sinha and Sinha (1998) employed econometric techniques to validate or invalidate the claim that higher saving rate leads to high growth rate. The empirical results did not support the view that higher saving rate causes higher economic growth. The authors concluded that causality runs from economic growth to saving. Mohan (2006) examined the relationship between domestic savings and economic growth by taking into consideration the income levels of the different countries studied. He grouped the countries into various categories, namely low income countries (LICs), low middle income countries (LMCs), upper middle income countries (UMCs), and high income countries (HMCs). The author's results support the claim that causality runs from economic growth rate to growth rate of savings. The author submitted that the income level of a country plays an important role in determining the causal relationship between savings and economic growth. In addition, the author reported that empirical results were mixed in the LICs, while causality runs from growth rate to savings rate for most of LMCs. Finally, whereas in the HICs (except Singapore), causality runs from economic growth rate to growth rate of savings, a feedback causal relation was more prevalent in the UMCs.

Bassam AbuAl-Foul (2010) employed an econometric technique to investigate the long-run relationship between real gross domestic product and real gross domestic saving for Morocco and Tunisia during the period 1965-2007 and 1961-2007, respectively. The regression exercise reveals interesting results. For instance, it was shown that whereas a long-run relationship exists between gross domestic product and gross domestic saving in Morocco, there was no such evidence for Tunisia. Secondly, the Granger causality test indicates the existence of a two-way causal relationship between gross domestic product growth and gross domestic saving growth in Morocco. Lastly, the author observed a unidirectional Granger causality between real gross domestic product and real gross domestic saving as causality runs from gross domestic saving growth to gross domestic product growth in Tunisia.

In the case of Nigeria, Abu (2010) employed the Granger-causality and co-integration techniques to analyze the relationship between saving and economic growth in Nigeria during the period 1970- 2007. The Johansen co-integration test indicates that the variables (economic growth and saving) are co-integrated, and that a long-run equilibrium exists between them. In addition, the granger causality test reveals that causality runs from economic growth to saving, implying that economic growth proceeds and granger causes saving. Thus, they reject the Solow's hypothesis that saving precedes economic growth, and accept the Keynesian theory that it is economic growth that leads to higher saving. The author recommends that government and policy makers should employ policies that would accelerate economic growth so as to increase saving. Olajide (2009) employed the Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) methodology to investigate the direction of causal relationship between saving and economic growth in Nigeria during the 1970 and 2006 period. The empirical results suggest that savings and economic growth are positively co-integrated indicating a stable long run equilibrium relationship. The causality test results showed the existence of a unidirectional causality between savings and economic growth and the complementary role of FDI in growth.

3.0 Definition of Model Variables and Methodology

Annual series data from 1980 to 2013 sourced from Central Bank of Nigeria statistical bulletin (2013) was employed. Economic growth proxied by log of GDP (LGDP), while private savings (SAV) was used to proxy domestic savings, Inflation (INF) and real interest rate are used as control variables to capture macroeconomic effect in the model. To fully explore the data generating process, we first examined the time series properties of model variables using the Augmented Dickey- Fuller test.

The ADF test regression equations with constant are:

$$\Delta LGDP_t = \alpha_0 + \alpha_1 LGDP_{t-1} + \sum_{j=1}^{k} a_j \ \Delta LGDP_{t-1} + \varepsilon_t ... \qquad (1)$$

$$\Delta SAV_t = \beta_0 + \beta_1 SAV_{t-1} + \sum_{j=1}^{k} b_j \ \Delta SAV_{t-1} + \varepsilon_t ... \qquad (2)$$

$$\Delta RER_t = \gamma_0 + \gamma_1 RER_{t-1} + \sum_{j=1}^{k} \varphi_j \ \Delta RER_{t-1} + \varepsilon_t ... \qquad (3)$$

$$\Delta_t = \lambda_0 INF + \lambda_1 \ INF_{t-1} + \sum_{j=1}^{k} \sigma_j \ \Delta INF_{t-1} + \varepsilon_t ... \qquad (4)$$

where Δ is the first difference operator ε_T is random error term that is iid k = no of lagged differences In equations (1) through (4), the null hypothesis holds as:

Ho: $\alpha_i = \beta_i = \gamma_i = \lambda_1 = 1$ (unit root) H_1: $\alpha_i \neq \beta_i \neq \gamma_i \neq \lambda_1 < 1$ (level stationary)

where j is the lag length, K is the maximum distributed lag length α_0, β_0, γ_0, λ_0, are the constant terms ε_T is independent and identically distributed error term.

The relationship between savings and economic growth can be represented in a dynamic Vector Error Correction Model (VECM) as follows:

$$\Delta LGDP_T = \beta_0 + \beta_1^1 \sum_{i=1}^{Q} \Delta LGDP_{T-1} + \beta_2^1 \sum_{i=1}^{Q} \Delta SAV_{T-1} + \beta_3^1 \sum_{i=1}^{Q} \Delta RIR_{T-1} + \beta_4^1 \sum_{i=1}^{Q} \Delta INF_{T-1} + \beta_5^{ecm} ECM_{T-1} + \varepsilon_{1T} \ldots \quad (5)$$

$$\Delta SAV_T = \beta_0 + \beta_1^1 \sum_{i=1}^{Q} \Delta SAV_{T-1} + \beta_2^1 \sum_{i=1}^{Q} \Delta LGDP_{T-1} + \beta_3^1 \sum_{i=1}^{Q} \Delta RIR_{T-1} + \beta_4^1 \sum_{i=1}^{Q} \Delta INF_{T-1} + \beta_5^{ecm} ECM_{T-1} + \varepsilon_{1T} \ldots \quad (6)$$

$$\Delta RIR_T = \beta_0 + \beta_1^1 \sum_{i=1}^{Q} \Delta RIR_{T-1} + \beta_2^1 \sum_{i=1}^{Q} \Delta LGDP_{T-1} + \beta_3^1 \sum_{i=1}^{Q} \Delta SAV_{T-1} + \beta_4^1 \sum_{i=1}^{Q} \Delta INF_{T-1} + \beta_5^{ecm} ECM_{T-1} + \varepsilon_{1T} \ldots \quad (7)$$

$$\Delta INF_T = \beta_0 + \beta_1^1 \sum_{i=1}^{Q} \Delta INF_{T-1} + \beta_2^1 \sum_{i=1}^{Q} \Delta SAV_{T-1} + \beta_3^1 \sum_{i=1}^{Q} \Delta RIR_{T-1} + \beta_4^1 \sum_{i=1}^{Q} \Delta LGDP_{T-1} + \beta_5^{ecm} ECM_{T-1} + \varepsilon_{1T} \ldots \quad (8)$$

where β^s are parameters to be estimated, Δ is the difference operator, ε_T, k are as defined above. The parameter β_i^{ecm} where i=1,2,...,5 should be negative (<0).

Following Sinha and Sinha (2007) and Rambalg and Doran (1996) as cited in Agu and Chukwu (2008), the Toda-Yamamoto (1995) causality test is valid for series that integrated or cointegrated and serves also as an augmented Granger causality test and is formulated as follows:

Let d_{max} = maximum order of integration in the VAR system below: The VAR $(c + dmax)$ shall be estimated to use the modified WALD test for linear restrictions on the coefficients of VAR which follows an asymptotic X^2-distribution. Using the Akaike Information Criteria (AIC) and Schwarz-Bayesian Information Criteria (SBC), the optimum lag length is determined to be four (4).

To increase the number of lags in the WALD model up to the maximum cointegration level of variables entered in the model is crucially fundamental in opting for the Toda-Yamamoto causality testing procedure. The Toda-Yamamoto approach is an alternative causality testing approach based on the Granger causality equation but augmented with extra lags determined by the potential order of integration of the series causally tested.

$$\begin{bmatrix} LGDP_T \\ SAV_T \\ RIR_T \\ INF_T \end{bmatrix} = \beta_0 + \beta_1 \begin{bmatrix} LGDP_{T-1} \\ SAV_{T-1} \\ RIR_{T-1} \\ INF_{T-1} \end{bmatrix} + \beta_2 \begin{bmatrix} LGDP_{T-2} \\ SAV_{T-2} \\ RIR_{T-2} \\ INF_{T-2} \end{bmatrix} + \beta_3 \begin{bmatrix} LGDP_{T-3} \\ SAV_{T-3} \\ RIR_{T-3} \\ INF_{T-3} \end{bmatrix} + \beta_4 \begin{bmatrix} LGDP_{T-4} \\ SAV_{T-4} \\ RIR_{T-4} \\ INF_{T-4} \end{bmatrix} + \begin{bmatrix} \varepsilon_T^{\lg dp} \\ \varepsilon_T^{elc} \\ \varepsilon_T^{e\lg} \\ \varepsilon_T^{inf} \end{bmatrix} \ldots \quad (9)$$

To test that economic growth (LGDP) does not Granger cause savings (SAV), the null hypothesis is stated as:
$H_0 : \beta_{ij} = 0$
Versus
$H_1 : \beta_{ij} \neq 0$ where β_{ij} are the coefficients of the variables.

4.0 Empirical Results and Discussions
4.1 Unit Roots Test Result
In this study, the Augmented Dickey Fuller (ADF) unit roots tests was employed to test for the time series properties of model variables. The null hypothesis is that the variable under investigation has a unit root against the alternative that it does not. The decision rule is to reject the null hypothesis if the ADF statistic value exceeds the critical value at a chosen level of significance (in absolute term). These results are presented in table I below.

Table 1: Unit Roots Test Result

Variable	ADF statistics			ADF statistics		
	Level	Critical values		1st difference	Critical values	
LGDP	-1.696999	1%	-3.6661	-3.823498	1%	-3.6752
		5%	-2.9627		5%	-2.9665
		10%	-2.6200		10%	-2.6220
SAV	1.245318	1%	-3.6661	-4.616964	1%	-3.6752
		5%	-2.9627		5%	-2.9665
		10%	-2.6200		10%	-2.6220
RIR	-0.322478	1%	-3.6661	-4.243125	1%	-3.6752
		5%	-2.9627		5%	-2.9665
		10%	-2.6200		10%	-2.6220
INF	-1.954693	1%	-3.6661	-3.314952	1%	-3.6752
		5%	-2.9627		5%	-2.9665
		10%	-2.6200		10%	-2.6220

The results of table 1 above show that all the variables are non-stationary in level form since their ADF values are less than the critical values at 5% , the null hypothesis of a unit root was accepted for all the variables but was rejected in 1st difference. Thus, we conclude that the variables under investigation are integrated of order one. (i.e. I(1)). Since the variables are integrated of the same order. We therefore, examine their co-integrating relationship using Johansen co-integration procedure.

4.2 Co-integration Test Result

A necessary but not sufficient condition for co-integrating test is that each of the variables be integrated of the same order. The Johansen co-integration test uses two statistics test namely: the trace test and the likelihood eigenvalue test. The first row in each of the table test the hypotheses of no co-integrating relation, the second row test the hypothesis of one co-integrating relation and so on, against the alternative of full rank of co-integration. The results are presented in table 2 below.

Table 2: Co-integrating Test Result between the Variables: LGDP SAV RIR INF

Eigen value	Likelihood Ratio	5% critical value	1% critical value	Hypothesized No of CE(s)
0.612426	54.05616	47.21	54.46	None*
0.429786	25.62070	29.68	35,65	At most 1
0.239683	8.76839	15.41	20.04	At most 2
0.018095	0.547809	3.76	6.65	At most 3

 *(**) denotes rejection of the hypothesis at 5% (1%) significance level.
 L.R. test indicates 1 co-integrating equation(s) at 5% level of significance

4.2.1 Interpretation of co-integrating results

From table 2 above, the likelihood statistics indicates the presence of one co-integrating equation at 5% significance level which implies that economic growth and energy consumption are co-integrated. This shows that there is a long-run positive relationship between economic growth and domestic savings in Nigeria. This implies causality in at least one direction.

Table 3: Toda-Yamamoto Causality (modified WALD) Test Results

Null hypothesis	Chi-Square (X^2)	P-value	Conclusion
LGDP does not granger cause SAV	2.323319	0.7905	Do not Reject Ho
SAV does not granger cause LGDP	110.2350	0.0000	Reject Ho
LGDP does not granger cause RIR	3.88942	0.7913	Do not Reject Ho
RIR does not granger cause LGDP	2.271408	0.8105	Do not Reject Ho
LGDP does not granger cause INF	11.12603	0.0322	Reject Ho
INF does not granger cause LGDP	2.048084	0.849672	Do not Reject Ho

4.3   Interpretation of Toda-Yamamoto Causality Test Result

From table 3 above, the Toda-Yamamoto causality test revealed that there is a uni-directional causality running from domestic savings (SAV) to economic growth (LGDP). This result validates the Solow's hypothesis that

savings preceeds economic growth but invalidates the Keynesian's hypothesis. The results further showed that economic growth causes inflation without a feedback. This result further support the works of Olajide (2009); Abu (2010) all for Nigeria and Basam Abu (2010) for Tunisia. The conclusion was arrived based on the fact that their Chi-square statistics were statistically significant at 5% as indicated by their p- values.

5.0 summary and policy recommendations
The main findings are itemized below as follows: 1) The ADF results show that the series are non stationary in their level form and are integrated of order one suggesting a random walk series. 2) Johansen co-integration test result shows evidence of co-integration implying that there is a long run relationship between economic growth and savings in Nigeria. 3) The Toda-Yamamoto causality test revealed that there is a uni-directional causality running from domestic savings (SAV) to economic growth (LGDP) validating the Solow's hypothesis.

Based on the research findings, the following recommendations were made. Since there is a robust one way causality from domestic private savings to economic growth, appropriate policies mix that will enhance domestic savings should be pursued. This should include pursuing inflation-adjusted savings rate policy to encourage savings and ensuring price stability in the country.

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