

Savings, Debt Overhang and Sustainable Development in Nigeria: An Impulse and Decomposition Analysis

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Abstract

This study employs cointegration and Granger causality tests as well as Structural Vector Autoregression (SVAR) on annual data for 1986–2016 to model savings, debt overhang and economic development (proxy is gross fixed capital formation) in Nigeria. Pair wise causality indicate feedback effects between savings as ratio of gross domestic product (GDP) and economic development although causality is stronger from savings as ratio of GDP to economic development. Block Exogeneity causality indicate that taken together, both gross domestic savings and debt overhang with their lags granger cause economic development at 1%. However, the effect of this significant impact is mostly due to the impact of gross domestic savings. Furthermore, there is no causality on all fronts concerning debt overhang which could indicate debt overhang is not really tied to economic fundamentals but could be the result of “corruption” occasioned by the chronic bad governance in Nigeria and thus cannot be readily predicted. Variance decomposition indicate most of the variation experienced by economic development is due to its own shock but the lagged effect seems not absolute; for as time passes, the contribution of gross domestic savings to economic development appears significant and lasting. Impulse response indicates that both gross domestic savings and public debt significantly stimulate economic development, but the effect of the stimulus from domestic savings is much more significant. In addition, the stimulus from public debt is mixed but largely positive. The study analyses of causality, variance decomposition and impulse response all clearly indicate the pre-eminence of domestic savings in stimulating economic development in Nigeria. The study recommends Government should do the needful to focus policies accordingly. In this respect, the current focus of government on excessive taxation may not be helpful in promoting savings.

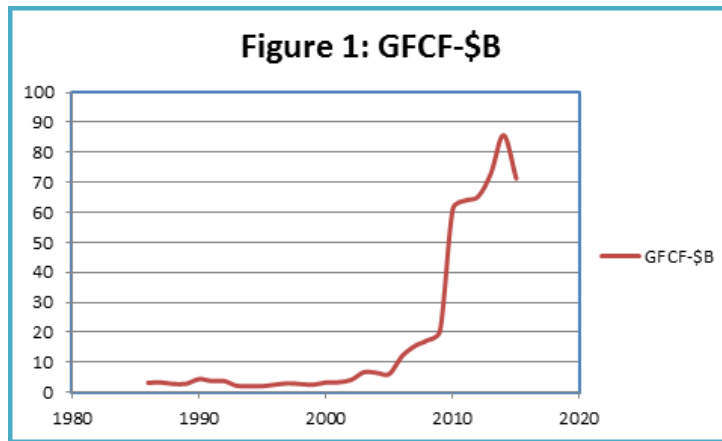
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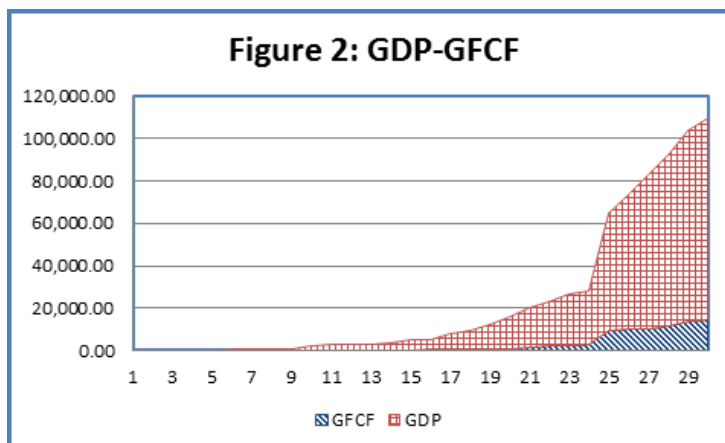
Background to the Study

In economic theory, investment increases not just aggregate demand but also increases future productive capacity. It is also an a priori expectation that investment is cyclical in most economies, rising and falling with periods of economic booms and bursts. Given such expectations therefore, countries with rapid economic growth rates in the general global scenario such as China and India have been heavily investing in more fixed assets to enable rapid economic growth. In this respect, gross fixed capital formation (GFCF) which is essentially net investment (since it measures the net increase in fixed capital) is usually an important macroeconomic barometer for economic performance. As such, we can say that Nigerian investment as given by her GFCF is a mirror of her economic performance; but the question is what has been the specific Nigerian scenario? Figures 1-3 below present some graphical stylized facts that provide some answers.

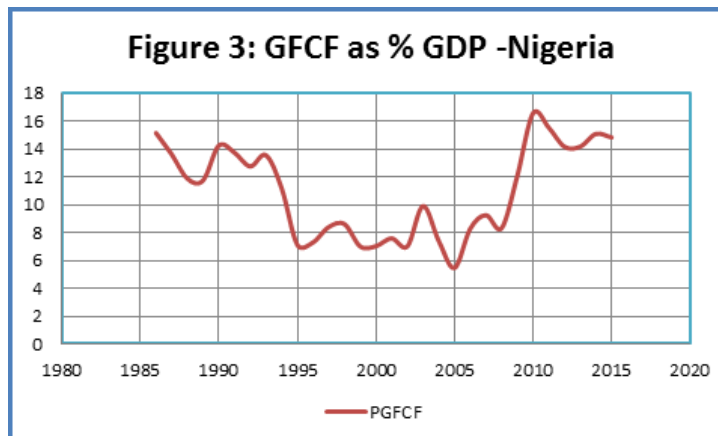


Source: World Bank data

Figures 1-2 show that Nigeria's net investment remained well under \$10 Billion for most of the past 30 years and also that it was a relatively insignificant portion of the gross domestic product (GDP) during the period.



Source: Central Bank data



Source: Author's computations from Central Bank data

From Figure 3, we see the dismal picture even more clearly as net investment as a percentage of GDP in Nigeria remained under single digits for most of the past 30 years and even now is far short of the world average at 20% and a far cry from performance of contemporary countries in ECOWAS like Cape Verde (36.5%), Liberia (33.3%), Senegal (30.7%), Benin Republic (27.4%) and Ghana (21.8%) according to World Bank national accounts data.

Statement of the Problem

The significance of government policy in the dynamics of an economy is well documented in literature (Arnelyn et al 2014). However, there are serious challenges regarding availability of empirical literature on the dynamics between government policy and capital formation. Not much has been done in empirical studies to capture the effects of government policy and their attendant shocks on capital formation or net investment; especially in the Nigerian case, and serious gaps therefore exist in literature in this area. This study aims to fill some of the gaps.

Objectives of the study

The main objective of the study is to examine the dynamics between government policy and capital formation in Nigeria over the period 1986 to 2016. Specifically the study is to determine causation in relationships between policy and capital formation as well as the effects of policy shocks. Following from this background to the study, Section 2 presents the literature review while Section 3 contains the methodology employed. Section 4 discusses the results and Section 5 concludes with some recommendations.

Literature Review

Theoretical Concepts

In brief, the neoclassical theorists generally oppose government intervention in economic activity and suggest the existence of an adverse relationship between government policy or intervention and macroeconomic variables. On the other hand, the Keynesian school of thought and proponents of government intervention in economic activity generally suggests a positive relationship between government policy or intervention and macroeconomic

variables. However, the Ricardian school of thought, also known as Ricardian equivalence, or the Barro-Ricardo equivalence generally suggests that government policies or interventions do not affect the total level of demand in an economy. Consequently, as established in economic literatures, the effects can either be negative, positive or none depending on the nature of the relationship between the government policy and the relevant macroeconomic variables, the methodology employed, the country of study and the nature of the data used by the different researchers (Cooray, 2009).

Thus, there is a sharp divergence of views on how government policy affects or ought to affect the economy. Moreover, into this mix, we now have what has been dubbed “the Washington Consensus”, which attempts to prescribe appropriate government policies, particularly in the context of developing countries via a plethora of policies and institutions that are pushed upon developing countries by the institutions of the international economy-the international monetary fund (IMF) and the World Bank. Little wonder that James Tobin, the Nobel laureate in Economics in 1981, observed: “Few issues of economic theory and fact evoke such polar disagreement. The contesting views carry relatively divergent implications for public fiscal and financial policy”.

Empirical Review

It has been reported in literatures that if government increases borrowing (especially from the banks) in order to finance its expenditure; it will compete with (crowd-out) the private sector, thus reducing private investment. Furthermore, borrowing which could result in debt crisis may lead to high real interest rates in the domestic economy and crowd out private sector or investments (Easterly & Schmidt, 1991; Ndung'u, 1995). In another report, Michele (2005) examined the dynamic effects of government policy shocks on employment in the U.S economy and indicated that a shock in government employment is negative for private output and a positive impulse for government output because output is reallocated from private to government sector. Table 1 below shows some summarized relevant empirical findings in literature concerning effects of government policy.

Table 1: Selected Empirical Findings

Athour(s)	Country(s)	Investigation	Main results
Amin (1998)	Cameroon	Contributions of fiscal policy to economic growth - 1961-1994	Mixed evidence of contributions.
Abu-Bader and Abu-Qarn (2003)	Egypt, Israel and Syria	Government expenditure and economic growth causality	Bi-directional and negative causation. Mixed evidence of Impact
M'Amanja and Morrissey (2005)	Kenya	Relationship between fiscal policy and economic growth	Mixed evidence of a relationship
Ocran (2009)	South Africa	Relationship between fiscal policy and economic growth	Positive and significant impact
Brasoveanu and Brasoveanu (2009)	Romania	Impact of fiscal revenues on economic growth	Negative causality
Adefeso, Mobalaji & Salawa (2010)	Nigeria	Impact of fiscal policy on economic growth	Positive effect on economic growth
Abu and Usman (2010)	Nigeria	Effect of government expenditure on economic growth	Positive effect on economic growth
Sikiru and Umaru (2011)	Nigeria	Fiscal policy and economic growth causality	Causality not confirmed
Ogbole, Sonny and Isaac (2011)	Nigeria	Impact of fiscal policy during regulation and deregulation	Differences exist in effectiveness during and after regulation
Nworji et al (2012)	Nigeria	Effect of public expenditure on economic growth	Mixed effects
Munongo (2012)	Zimbabwe	effectiveness of fiscal policy	Mixed effects
Dinca and Dinca (2013)	European Union	Effects of the fiscal policy on economic growth	Mixed effects
Oseni and Onakoya (2013)	Nigeria	Impact of fiscal policy on sectoral output	Significant impact
Nwanne (2014)	Nigeria	Impact of savings and investment on economic growth	Positive and significant effect
Nwannebuike, Ugwu and Onwuka (2016)	Nigeria	Impact of external debt on economic growth	Positive impact in short run, but negative in long run

Source: Author, 2018

Methods and Materials

The Model and Modelling Procedure

The Structural Vector Autoregression (SVAR) methodology offered by Blanchard and Quah (1989), Enders (2014) and Awad (2011) is adopted and employed. The attraction of the SVAR is that it enables restrictions on the structural system and hence its identification based on

economic theory in order to recover the structural innovations from the reduced form residuals and further to retrieve the responses of the variables to structural shocks. The estimation procedure consisting of the following steps was employed:

1. Time series analysis, Lag length specification and Augmented Dickey-Fuller -GLS (ADF-GLS) unit root tests to determine stationarity. The ADF-GL Stest is more appropriate where the variable to be tested is assumed to exhibit a linear trend.
2. The SVAR procedure with requisite restrictions.
3. The SVAR based cointegration test methodology developed by Johansen (1991; 1995). This addresses the question of long-run determinants and other system variables.
4. Granger Causality tests.
5. Choleski Forecast Error Variance Decomposition (FEVD) analysis on the basis of step 2. This estimates the relative significance of each random innovation to the system variable if policy does not change and looking ahead. From this, we obtain the proportion of movement in a sequence that occurs due to own shocks as against shocks to other variables in the model. That is, it shows the distribution of forecasting errors of a variable to itself and other variables in the system.
6. Choleski Impulse Response Function (IRF) analysis on the basis of step 2. This estimates the time path of the various shocks on the variables contained in the SVAR system. That is, it shows the time path response of variable to shock in itself and shock to other variables in the model.

Variable Definitions and Ordering

The categories of the variables GFCF, GTD, GDS and SRG are defined and specified in Box 1. The endogenous variables (GFCF, GTD) are considered structural variables and the variables GDS and SRG policy instruments. The choice of variables is inspired by both the background discussion above and the findings in the literature. For the purpose of focus, GFCF as defined is assumed to be most endogenous. The reason for the ordering is to enable structural factorization in addition to the Cholesky vector autoregressive ordering.

Box1: Definition of Variables	
Variable	Definition
SRG	Savings as Ratio of GDP is a policy instrument
GDS	Gross Domestic Savings is a policy instrument
GTD	Government Total Debt which represents debt overhang is defined as Domestic and Foreign Borrowings
GFCF	Gross Fixed Capital Formation is a proxy for economic development

Data Sources

Secondary annual data for the period 1986 – 2016 is obtained from the Central Bank of Nigeria National Bureau of Statistics, World Bank, International Monetary Fund and pertinent derivatives there from.

Results and Discussions

Analysis of Trends, Lag Order Selection, Unit Root Tests and Cointegration Analysis

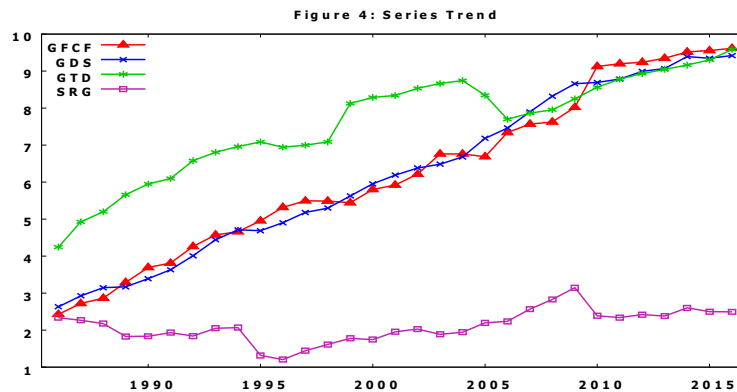


Figure 4 above plots the log form of the series for gross fixed capital formation (GFCF), government total debt (GTD), gross domestic savings (GDS) and savings as ratio of GDP (SRG) used for this study and indicates multiple trends over the study period from 1986-2016. From Figure 4, gross fixed capital formation, government total debt and gross domestic savings trended mostly upwards and all three converged and became intertwined by the last trimester of the period. However, while gross fixed capital formation, gross domestic savings and savings as ratio of GDP appeared to have a common starting point at the beginning of the period, there was a sharp divergence almost immediately by savings as ratio of GDP which then continued to drift away trending mostly downward within the period with a noticeable spike in 2009. On the other hand, gross fixed capital formation and gross domestic savings remained as thick as thieves, being intertwined throughout the study period.

Table 2: VAR Lag Order Selection

Endogenous variables: LGFCF LGTD LGDS

Exogenous variables: C LSRG

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-67.20398	NA	0.031291	5.048550	5.331439	5.137147
1	33.10913	166.0355*	5.82e-05*	-1.248906*	-0.541684*	-1.027413*
2	38.11917	7.255911	7.92e-05	-0.973736	0.157819	-0.619347

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE = Final prediction error, AIC = Akaike criterion, SC = Schwarz criterion and HQ = Hannan-Quinn criterion

Table 3: ADF-GLS Unit Root Test (Perron-Qu Method) Results

Variables	ADF-GLS T-Statistics @ Level	p-value	ADF-GLS T-Statistics @ 1 st Difference	p-value	Order of Integration
GFCF	0.307824	0.7747	-5.38633	1.121e-007	1(o)
GDS	0.109688	0.7174	-4.1084	4.131e-005	1(o)
GTD	0.104796	0.7159	-3.29993	0.0009464	1(o)
SRG	-1.58707	0.106	-5.05891	5.628e-007	1(o)

Source: Authors computation using Gretl

Table 2 above reports a maximum/optimal lag order 1 is selected by all the information criteria while the unit root test results in Table 3 indicate that the variables are integrated of order one i.e. they are stationary at first difference.

Johansen Cointegration Test Results

The decision rule being to reject the null hypothesis of no cointegration if the computed statistic is greater than the critical value, Table 4 results indicate the rejection of no co integration under none for both the trace and Max-Eigen statistics. This indicates one cointegrating equation or cointegrating vector at 5 percent and establishes the existence of long-run relationship.

Table 4: Unrestricted Co-integration Rank Test

Series: GFCF GTD

Exogenous series: GDS SRG

Hypothesized No. of CE(s)	Trace Statistic	Prob.**	Hypothesized No. of CE(s)	Max- Eigen statistics	Prob.**
None *	41.64008	0.0014	None *	27.49354	0.0055
At most 1	14.14654	0.0790	At most 1	8.550856	0.3254
At most 2*	5.595686	0.0180	At most 2*	5.595686	0.0180

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Granger Causality Tests (Pairwise and SVAR Block Exogeneity)
Table 5: Result of the Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	Decision
GFCF does not Granger Cause GDS	29	0.28287	0.7561	Accept
GDS does not Granger Cause GFCF		9.27804	0.0010	Reject
GTD does not Granger Cause GDS	29	0.62210	0.5453	Accept
GDS does not Granger Cause GTD		2.63478	0.0924	Reject
SRG does not Granger Cause GDS	29	1.13499	0.3381	Accept
GDS does not Granger Cause SRG		2.65394	0.0909	Reject
GTD does not Granger Cause GFCF	29	0.00974	0.9903	Accept
GFCF does not Granger Cause GTD		1.72737	0.1991	Accept
SRG does not Granger Cause GFCF	29	3.70199	0.0397	Reject
GFCF doesnot Granger Cause SRG		2.71245	0.0867	Reject
SRG does not Granger Cause GTD	29	0.47180	0.6295	Accept
GTD does not Granger Cause SRG		1.59782	0.2231	Accept

The result of the Pair Wise Granger Causality test in Table 5 above shows that there is a very strong unidirectional causality between gross domestic savings (GDS) and gross fixed capital formation (economic development), weak unidirectional causality between gross domestic savings (GDS) and government total debt and also weak unidirectional causality between gross domestic savings (GDS) and savings as ratio of GDP (SRG). This implies that the past values of gross domestic savings can be used to predict the future value of economic development, government total debt as well as the savings as ratio of GDP in Nigeria. In addition, there is bidirectional causality between savings as ratio of GDP and economic development although causality is stronger from savings as ratio of GDP to economic development. This further implies that while the past values of savings as ratio of GDP can be used to predict the future value of economic development in Nigeria, past values of economic development can also be used to predict the future value of savings as ratio of GDP.

Table 6: VAR Granger Causality/Block Exogeneity Tests

Dependent variable: GFCF			
Excluded	Chi-sq	df	Prob.
GTD	2.369879	1	0.1237
GDS	26.07218	1	0.0000
All	26.40023	2	0.0000
Dependent variable: GTD			
Excluded	Chi-sq	df	Prob.
GFCF	0.530163	1	0.4665
GDS	0.030797	1	0.8607
All	2.109304	2	0.3483
Dependent variable: GDS			
Excluded	Chi-sq	df	Prob.
GFCF	1.144298	1	0.2847
GTD	6.712641	1	0.0096
All	7.636996	2	0.0220

The results of Block Exogeneity tests presented in Table 6 above indicate that for Eq1, gross domestic savings (GDS) with its lag granger causes economic development (GFCF) at 1% but debt overhang (GTD) with its lag does not granger cause economic development. Taken together however, all explanatory variables with their lags granger cause economic development at 1%. This shows that while both gross domestic savings and debt overhang as a whole impact economic development, the effect is mostly due to the impact of gross domestic savings.

For Eq2 where debt overhang (GTD) is the dependent variable, there is no granger causality on all fronts whether the variables are taken singly or together. This could indicate debt overhang (GTD) in Nigeria for the period is not really tied to economic fundamentals but could be the result of “corruption” occasioned by the chronic bad governance and thus cannot be readily predicted.

For Eq3, debt overhang (GTD) with its lags granger causes gross domestic savings (GDS) at 1% but economic development (GFCF) with its lag does not granger cause domestic savings (GDS). Taken together, all explanatory variables with their lags granger cause domestic savings (GDS) at 5%. This shows that while both economic development and debt overhang as a whole impact gross domestic savings, the effect is mostly due to the impact of debt overhang.

Structural Vector Autoregression (SVAR) Results

To observe the effect of government policy shocks on development and debt overhang in Nigeria, we employ the results of the Forecast Error Variance Decomposition (FEVD) and Impulse Response Function (IRF) analyses from the estimated SVAR model as presented below.

Forecast Error Variance Decomposition Analysis

Tables 7 A-C below provides the estimates of the Forecast Error Variance Decomposition (FEVD). The variance decomposition outputs in Tables 7A-C indicate that in the period right after a shock, economic development (GFCF) explains 100 percent of its own shocks, debt overhang (GTD) about 99 percent of its own shocks and gross domestic savings (GDS) about 98 percent of its own. The fact that their movements are largely explained by past values indicates they have significant lagged effect but the lagged effect for both debt overhang (GTD) and gross domestic savings (GDS) seems more absolute.

Own shock has the strongest and most lasting effect on both debt overhang and gross domestic savings although as time passes after period 2, the contribution of gross domestic savings (GDS) to economic development (GFCF) appears significant and lasting, even overtaking own shocks of economic development after period 6 at 49 percent. Debt overhang instantly explains about 2 percent of the shocks in gross domestic savings and this contribution increases slowly but steadily and becomes significant and lasting after period 6 from about 21 percent.

Table 7A: Decomposition of Variance for GFCF

Period	S.E.	GFCF	GTD	GDS
1	0.180888	100.0000	0.000000	0.000000
2	0.216275	81.19647	3.597810	15.20572
3	0.242214	66.97946	3.892583	29.12796
4	0.261583	58.29938	3.337745	38.36287
5	0.277370	52.40392	3.534012	44.06207
6	0.291309	47.94810	4.640960	47.41094
7	0.304068	44.38602	6.326494	49.28748
8	0.315842	41.47042	8.243696	50.28588
9	0.326677	39.05837	10.16151	50.78012
10	0.336600	37.04879	11.95767	50.99354

Table 7B: Decomposition of Variance for GTD

Period	S.E.	GFCF	GTD	GDS
1	0.265057	0.701649	99.29835	0.000000
2	0.335065	0.471186	99.51275	0.016068
3	0.368381	0.523864	99.45010	0.026034
4	0.385931	0.618048	99.24274	0.139214
5	0.396142	0.705896	98.91232	0.381781
6	0.402752	0.780395	98.49227	0.727331
7	0.407480	0.842903	98.02140	1.135699
8	0.411146	0.895900	97.53243	1.571674
9	0.414157	0.941499	97.04841	2.010095
10	0.416728	0.981269	96.58364	2.435089

Table 7C: Decomposition of Variance for GDS

Period	S.E.	GFCF	GTD	GDS
1	0.120129	0.000811	1.813430	98.18576
2	0.154407	0.642780	2.818971	96.53825
3	0.179257	1.346114	6.617173	92.03671
4	0.200022	1.889626	10.86220	87.24818
5	0.218037	2.279764	14.70905	83.01119
6	0.233858	2.559455	17.96074	79.47980
7	0.247829	2.764282	20.64297	76.59275
8	0.260214	2.918353	22.84154	74.24011
9	0.271230	3.037298	24.64684	72.31586
10	0.281058	3.131278	26.13740	70.73132

Cholesky Ordering: GFCF GTD GDS

Impulse Response Analysis

This analysis is employed to observe the response of economic development, debt overhang and gross domestic savings to innovations in the government policy variable incorporated in the model. The IRFs are presented in the figures 5 -7 below.

Figure 5: Response of GFCF to Cholesky One S.D. Innovations

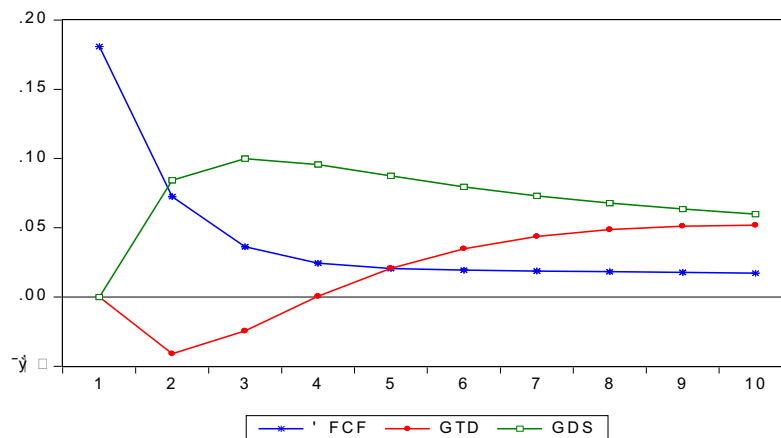


Figure 5 depicts the response of economic development to own shock and shocks in debt overhang and gross domestic savings in Nigeria. The IRF plots show a non-response of economic development to shocks in debt overhang and gross domestic savings in the first period, but afterwards, while the response to shocks in debt overhang was sharply negative for the next two periods, it became increasingly positive and rapid from the fourth period up to the tenth period in a converging pattern with gross domestic savings. This indicates that debt overhang has a mixed but largely positive impact on economic development. On the other hand, the plot shows that at the first period, there was non-response of economic development to shock in gross domestic savings, but after the first period, the response was sharply positive but peaked shortly in period three only to maintain a slightly downward spiral up to the end of the tenth period although it remained positive and significant. This indicates that gross domestic savings has a positive impact on economic development in Nigeria, much more than the impact of public debt. Furthermore, the plots show there was a sharp decline in the response of economic development to own shock in the first 3-4 periods and afterwards, this response remained positive but marginal through to the tenth period. This indicates that own shock has a positive but largely insignificant impact on economic development in Nigeria.

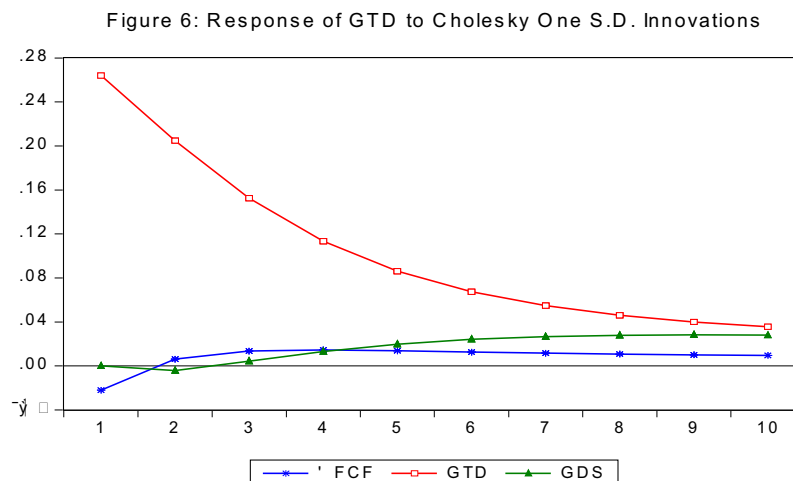


Figure 6 depicts the response of debt overhang to own shock and shocks in economic development and gross domestic savings in Nigeria. The IRF plots show a non-response of debt overhang to shocks in gross domestic savings in the first period, but afterwards, while the response to shocks in gross domestic savings was briefly mildly negative in the next period, it became increasingly positive from the third period up to the tenth period. This indicates that gross domestic savings has a largely positive impact on debt overhang. On the other hand, the plot shows that at the first period, there was negative response of debt overhang to shock in economic development, but after the first period, the response was largely positive but marginal up to the end of the tenth period. This indicates that economic development has a largely positive impact on public debt in Nigeria but much less than the impact of gross domestic savings. Furthermore, the plots show the response of public debt to

own shock has been a steep and steady decline through to the tenth period but remained positive. This indicates that own shock has a positive but largely insignificant impact on public debt in Nigeria.

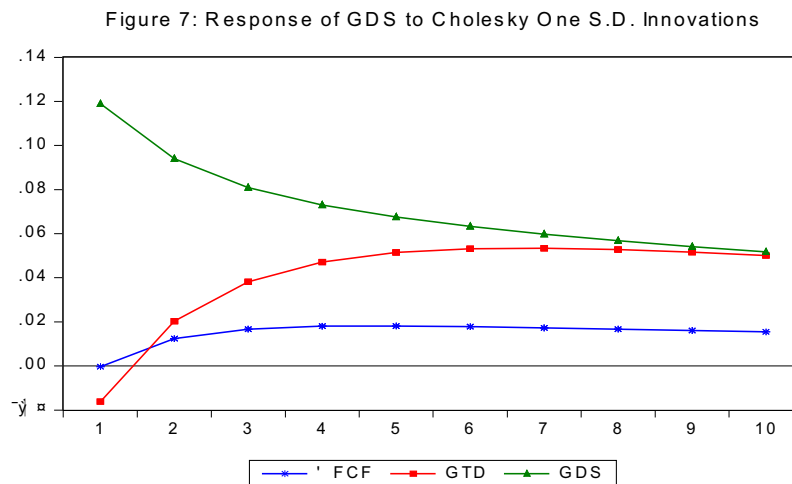


Figure 7 depicts the response of gross domestic savings to own shock and shocks in economic development and debt overhang in Nigeria. The IRF plots show a non-response of gross domestic savings to shocks in economic development in the first period, but afterwards, the response to shocks in economic development remained positive from the second period up to the tenth period. This indicates that economic development has a positive impact on domestic savings. On the other hand, the plot shows that at the first period, there was a negative response of gross domestic savings to a shock in debt overhang, but after the first period, the response was significantly positive up to the end of the tenth period. This indicates that public debt has a large significantly positive impact on gross domestic savings in Nigeria, much more than the impact of economic development. Furthermore, the plots show the response of gross domestic savings to its own shock has been a steady decline through to the tenth period but remained positive in a converging pattern with public debt which culminates in the tenth period. This indicates that an own shock has a positive impact on gross domestic savings and may have an inverse relationship with shocks from public debt in Nigeria.

Conclusion and Recommendation

Conclusion

In this study, annual data for 1986–2016 and a set of articulated structural variables are employed to model savings, debt overhang and economic development (proxy is gross fixed capital formation) in Nigeria. The analysis comprises cointegration and Granger causality tests as well as structural vector Autoregression (SVAR). Pairwise Granger causality tests indicate feedback effects between savings as a ratio of gross domestic product (GDP) and economic development although causality is stronger from savings as a ratio of GDP to economic development. Block Exogeneity Granger causality tests indicate that taken together, both gross domestic savings and debt overhang with their lags Granger cause

economic development at 1%. However, the effect of this significant impact on economic development is mostly due to the impact of gross domestic savings.

Furthermore, there is no causality on all fronts concerning debt overhang equation which could indicate debt overhang in Nigeria for the period is not really tied to economic fundamentals but could be the result of “corruption” occasioned by the chronic bad governance and thus cannot be readily predicted. Variance decomposition outputs indicate most of the variation experienced by the economic development variable is due to its own shock but the lagged effect seems not absolute; for as time passes, the contribution of gross domestic savings to economic development appears significant and lasting. Impulse response outputs indicate that on the whole, both gross domestic savings and public debts significantly stimulate economic development, but the effect of the stimulus from domestic savings is much more significant. In addition, the stimulus from public debt is mixed but largely positive.

Recommendations

The study analyses of causality, variance decomposition and impulse response all clearly indicate the pre-eminence of domestic savings in stimulating economic development in Nigeria. The study recommends Government should do the needful to focus policies accordingly. In this respect, the current focus of government on excessive taxation may not be helpful in promoting domestic savings in the country.

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