

## **Interrelationship Between Fiscal Deficit, Aggregate Savings and Investment: A Test of Ricardian Equivalence Hypothesis in Nigeria**

*Ogbuagu Matthew Ikechukwu\* & Joseph A. Omojolaibi†*

### **Abstract**

*Conflicting results on the relationship between government fiscal deficit, savings and investment behaviour of households remains unresolved. Some authors have argued that households might unconsciously play out adherence to the dictates of the Ricardian equivalence hypothesis (REH) because they practice an infinite consumption horizon. Relying on the vector autoregression (VAR) technique and the impulse response function (IRF), this study examines the validity of the REH and the interactions between fiscal deficit, aggregate savings, and private investment in Nigeria within a 48-year period. The results reveal that government fiscal deficit exerts negative effects on gross domestic savings and investment, which is further affirmed by the impulse response function (IRF). These findings rather uphold the neoclassical literary arguments that economic growth is retarded due to crowding out effects resulting from fiscal deficits; hence opposing the REH. Thus, policy-makers should adhere to the fiscal deficits benchmark of less than 40 percent of GDP as proposed by the International Monetary Fund (IMF) to maintain stable macroeconomic conditions.*

**Keywords:** *fiscal policy, saving-investment, neoclassical theory*

**JEL Classification:** *E62, E21-E22, E23*

### **1. Introduction**

The great recession in the 1980s was associated with stagflation which the Keynesian propositions could not proffer explanations in terms of its causes, persistence, and solution. This critical search for explanations and solution led to the birth of the Ricardian equivalence as proposed by the Neoclassical theory. According to Ezeabasili & Egbunike (2014) and Ogba (2014), there are three theoretical perspectives to explain the Ricardian equivalence hypothesis. The first is associated with the Keynesian argument, which posits that an upsurge in debt due to tax slash increases disposable income, and as such stimulates aggregate demand. The second is the neoclassical perspective which believes that government debt causes commercial bank deposit to fall, thereby triggering a higher interest rate, and hence crowding out private investment. The open economy is characterized by increased consumption that encourages external borrowing, leading to current account deficit. This is the reason behind the structural

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\*Federal University Oye-Ekiti, Department of Economics, Faculty of Social Sciences: [matthew.ogbuagu@fuoye.edu.ng](mailto:matthew.ogbuagu@fuoye.edu.ng) (Corresponding Author)

†University of Lagos, Department of Economics, Faculty of Social Sciences: [iomojolaibi@unilag.edu.ng](mailto:iomojolaibi@unilag.edu.ng)

adjustment program where less developed countries were advised to cut down fiscal deficit, improve private savings and investment growth; and hence external debt burden (Khalid, 1996). Thirdly, the Ricardian equivalence proposes that economic agents are rational, foresighted and understand that current tax cuts would evolve into future tax burden. Therefore, current tax reductions will cause households to increase savings to finance future tax increments since households possess an infinite overlapping generation (Ayunasta et al., 2020).

In line with the above, economic agents realize that current tax values are a function of the nature of government expenditure, and so do not influence private consumption; rather it encourages economic agents to save because of their future generation. This is because households are an infinite generation. Therefore, the Ricardian equivalence (RE) proposition is an improvement on the Keynesian and Neoclassical theories, which started with the proposition by Barro (1989). Here, Barro (ibid.) argued that consumers are forward-looking, and as such their expenditures are influenced by current and future expected income. This is because current debt is equivalent to future taxes. Afterwards, Kormendi & Meguire (1990) improved and consolidated on the existing arguments by modelling expectations using the Kyock transformation.

The above notwithstanding, Nkalu et al. (2016) opine that available data exhibits the fact that Nigeria has experienced more budget deficits than balanced or surplus one (see Figure I). Here, surplus budgets were recorded in some few years around the 1970s because of the oil boom resulting from unrest in the Middle East. On the other hand, the 1980s witnesses more years with budget deficits because of the structural adjustment program arising from oil glut; and it leapfrogged into the 1990s. Despite the above, between 2000 and 2010 only about three years had budget surpluses, and that was between 2003 and 2007. Afterwards, the economy slumped back into deficit because of the subprime crisis that held sway from 2007 to 2010. Although, there was a little improvement in the deficit between 2011 and 2015, the Nigerian economy witnessed larger deficits between 2016 to date because of a drastic fall in oil price due to the discovery of the shale oil in the United States. Improvements are yet to be seen even with a substantial increase in oil price, which had been countered by a huge election budgets (CBN, 2018); and most recently increased borrowing to fund health expenditures and government palliatives triggered by the coronavirus pandemic (Nwokolo et al., 2020a). As accounted above, in most less developed countries like Nigeria, the deficit gap has been deepening at an increasing rate due to financial crisis, increasing uncertainty in the global geopolitical environment, impact of commodity price crash, asset market volatility, and shock in global economic activities triggered by the coronavirus pandemic (IMF, 2020; Nwokolo et al., 2020b).

The Ricardian equivalence hypothesis is important not only for assessing the effectiveness of fiscal policy, but also relevant for designing macroeconomic models. For instance, Kormendi and Meguire (1986), Leiderman and Razin (1988), and Afonso (2008) have reported evidence consistent with the Ricardian hypothesis in

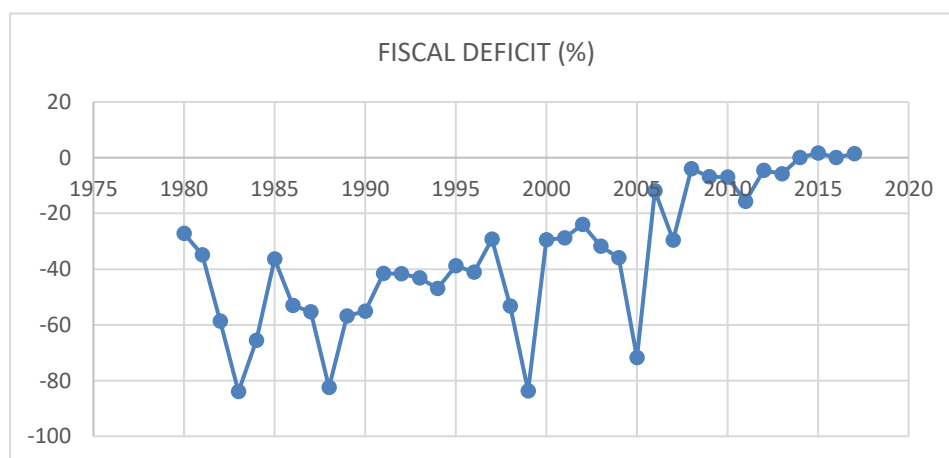
the United States, Israel, and Italy, respectively. However, Evans (1993), Himarios (1995) and García and Ramajo (2002) obtained an opposing result in 19 OECD countries, United States, and Spain, respectively.

The argument on whether the Ricardian equivalence is applicable in Nigeria and other less developed countries in general is on-going. Therefore, it is pertinent to re-examine the validity of this hypothesis. The major difference in this study compared to others is in the scope and methodology. This study covers periods before, during, and after the structural adjustment program (SAP) as obtained from the Central Bank of Nigeria statistical bulletin, 2018; and World Bank Development Indicators (WDI), 2018. Also, it uses the vector autoregression (VAR) model, Granger causality, and impulse response function approaches to examine the interrelationship between fiscal deficit, aggregate savings, and investment in Nigeria.

The other sections of this paper are separated into the following. Section two presents the stylized facts; section three reviews the literature; while section four focuses on the methodology and model specification. Section five contains the empirical analysis; while section six proffers summary, concluding remarks and policy formulation.

**2. Stylized Facts**

This section presents the trend of fiscal deficit, aggregate saving, and private investment. Figure 1 shows that between 1980 and 2014, fiscal deficit recorded negative values; and became positive only in 2015, 2016 and 2017. In 1980, the value of fiscal deficit was -27% of GDP, and the negative value deepened up to -35%, -60% and -84% between 1981 and 1983. In 1984 and 1985, the deficit reduced from -65% to -36% respectively.



**Figure I: Trend of Fiscal Deficit (percent (%))**

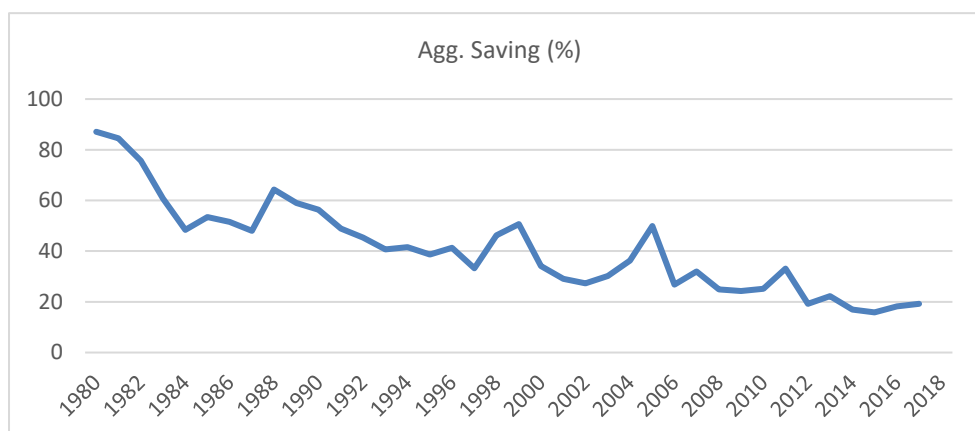
**Source:** Authors' compilation, 2020 from CBN (2018) and WDI (2018) database

The high level of deficits within these periods were because of the crude oil glut, prompting the government to borrow more to close the revenue short falls. Despite the structural adjustment program, which was the precondition to borrow, the deficit still remained above the IMF benchmark for the period between 1986 and 1990. The year 1991 witnessed a steady drop in the deficit spending from -40% to -29% in 1997, before slumping into deeper negative values of -52% and -83% in 1993 and 1994, respectively. In year 2000, the deficit fell sharply to -30%, and then to -22% in 2002; before increasing back to -71% in 2005. The high levels of deficits between 1980 and 2005 could be accounted on the need to provide infrastructure, match the increasing wage bill (minimum wage) and fluctuations in crude oil prices. After an initial increment in 2007, fiscal deficits continued to fall until it became balanced in 2014. The remaining years up to 2017 and 2018 were positive.

Unlike the fiscal deficit trend, aggregate savings exhibited a steady downward movement within the sampled period. This might account for why the regression results did not support the Ricardian equivalence hypothesis (REH). For instance, between 1980 and 1984, the value of aggregate saving as a percentage of GDP fell from 87% to 48%. This steep decline in aggregate savings corresponds with the oil glut of the early eighties. However, between 1985 and 1988 there was little improvement of up to 65% of GDP. Beyond 1988, the trend of saving continued to fall from 60% in 1990 to 33% in 1997. These periods correspond with the implementation of the structural adjustment program (SAP) that promoted expansionary fiscal policy.

Besides government policies, other factors that hampered aggregate savings were inflationary pressures and macroeconomic volatility. The value of aggregate savings remained stable between 1998 and 2005 at 50%. This marks the era of democratic dispensation. Beyond 2005, the trend continued to decline from 28% in 2006 to 16% in 2015. These periods marked the sub-prime crisis of 2008-2010 and the second wave of economic recession in 2016 resulting from the fall in demand and price of crude oil because of the discovery of shale gas in the United States. The values of aggregate savings remained below 20% of GDP between 2016 and 2018. The dwindling rate in the percentage of aggregate savings was responsible for the high rate of interest, and perhaps the low levels of private investment that is detrimental to economic growth and development. Drawing from the above, it is obvious that households cannot save during periods of fiscal expansion due to the vicious cycle (see Figure 2).

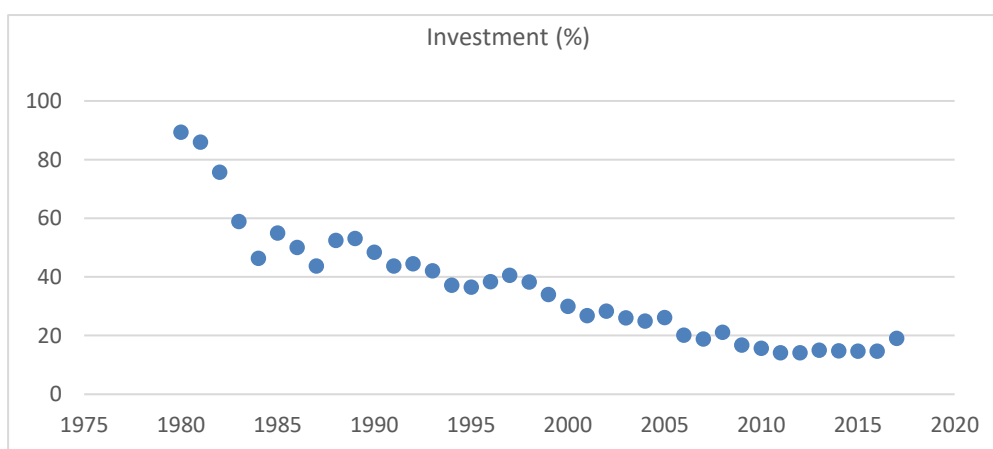
The trend of private investment continued to decline steadily throughout the sample periods. In 1980, private investment was at 90%, while 1997 witnessed a stiff decline to 40%. This downward trend was maintained even in 2016, which was the lowest at approximately 14%. Interestingly, the sharp decline in private investment could be explained by the high interest rate arising from the fall in aggregate saving as witnessed in Figure 2. Also, the recession explained in 2016 provides explanations why private investment was lowest during this period. However, the trend advanced minimally to 20% in 2018.



**Figure 2: Trend of Aggregate Savings in Nigeria (Percent of GDP)**

Source: Authors' compilation, 2020 from CBN (2018) and WDI (2018) database

Thus, the trend supports that expansionary fiscal policies have not transmitted into improvements in aggregate demand as proposed by the Keynesian theory. Similarly, the trend does not support the Ricardian equivalence hypothesis as witnessed in the regression results. These observations might be linked to structural rigidities and distortions.



**Figure 3: Trend of Private Investment (Percent of GDP)**

Source: Authors' compilation, 2020 from CBN (2018) and WDI (2018) database

### 3. Literature Review

#### 3.1 Theoretical Review

The review of theories focuses mainly on those that explain the interrelationships between fiscal deficits, aggregate savings, and investment. Here, the paper reviews the Keynesian and Neoclassical theories.

The Keynesian theory postulates that a slash in taxes, which are financed with government fiscal deficit, causes disposable income to up-shoot, and as such stimulate aggregate demand via increased significant positive effects on aggregate consumption. The increased deficits in turn leads to higher real interest rates, and then crowd-out private investment. Here, prevalence of equilibrium might cause unemployment to rise: Keynes (1936) argues that government fiscal deficit is usually instigated through increased government spending or a reduction in taxes that forces aggregate consumption and in turn aggregate demand to rise. The above inter-reactions might be because households are neither rational nor farsighted, and do not exhibit altruistic characteristics triggered from the infinite household consumption horizon.

On the other hand, the Neoclassical theory—spearheaded by David Ricardo—posits that because taxpayers (firms and households) are rational and see through intertemporal lenses, they are aware first-hand that present tax cuts or increase in government expenditures would be paid by them or their next generations in the form of reduced government expenditures or tax increments. Here, the main determinant of present discounted tax value is real government spending. This is in support of Say's law, which proposed that demand for government bond will rise to equate fiscal deficits. Thus, Barro (1989) expanded the role of the Ricardian equivalence in modern economic thought by emphasizing the need to distinguish short-run and long-run effects of government fiscal deficits on aggregate demand, and macroeconomic stabilization policy through evaluation of existing theories and hypothesis.

Since Ricardo argues that fiscal deficits only postpone taxes, he concludes that government fiscal deficits have negative significant effects on current consumption, which in turn up-shoots interest rates. Therefore, a rational agent would prefer to pay one dollar as tax today, rather than pay one dollar plus interest rate tomorrow. Since the timing of taxes does not alter household's life-cycle income, it cannot alter its consumption decisions. Drawing from the above, the Ricardian equivalence hypothesis is built on the following assumptions: (i) economic agents are rational and farsighted; (ii) perfect capital markets; (iii) tax postponement does not redistribute resources among generations; (iv) non-distortionary tax system; (v) utilization of deficits does not generate extra values; and (vi) government fiscal deficits do not alter the political process.

It is based on these assumptions that the criticisms of Mundell-Fleming Framework and the Ricardian Equivalence Hypothesis (REH) were formed. Notably, the neoclassical proponents argued that in a Ricardian framework, budget deficits that are financed through slashes in taxes and sales of government bonds would be seen by households as incurring future tax liabilities to service, and eventually retire increased debt (Ratha, 2011; Amaghionyeodiwe & Akinyemi, 2015). The Ricardian equivalence hypothesis (REH) dispenses entirely with the income-expenditure approach, and instead relies on the inter-temporal approach.

The REH asserted that since government's finance do not affect private agents' inter-temporal budget constraints; the real interest rate, aggregate savings and investment or current account balance will not be affected. Furthermore, they argued that budget deficits do not cause any interest and exchange rate changes; hence, they have no effect on current account imbalances (Chang & Hsu (2009). Therefore, it is important to state that the main assumption of the REH, which includes changes in budget deficit, will have no effects on domestic interest rates, total savings, investment, price level, and national income. Thus, we can conclude that budget deficit does not have any expansionary effect as households tend to increase savings in anticipation of higher taxes in the future, which neutralizes the effect of debt (Gadong, 2009); since government fiscal policy can be said to be impotent.

### **3.2 Empirical Review**

In analysing the relationship between budget deficit, aggregate saving and investment, the most commonly employed techniques and methodology have been the autoregressive distributive lagged (ARDL) model, seemingly unrelated regression (SUR), simple correlation regression, Granger causality test, cointegration test and vector error correction (VECM) model to mention a few (Chang & Hsu, 2009). The above can be seen in the following reviews.

Evans (1993) built a framework that modelled both the Ricardian equivalence and non-Ricardian theories. The author dubbed the alternatives as stochastic variant of Blanchard (1985) model. Using data from 19 countries, the paper compared the two categories of models above, and concluded that the Ricardian equivalence is clearly rejected. The study concluded that the Ricardian equivalence was rejected because households were constrained by perfect insurance market and lacked the basic principles of altruism. Dissecting this conclusion, it is obvious that households in the 19 sampled countries did not operationalize the infinite consumption horizon since they were not farsighted.

Similarly, using time series data collected from less developed countries, findings from Khalid (1996) reveal that results from most of these countries do not validate the Ricardian equivalence hypothesis. This could be interpreted in terms of the fact that government expenditure is not a good substitute for private consumption. The paper concluded that short-term increment in government spending may have expansionary effect on total demand because households need time to understand current policy, dissect implications to take an economic decision that would influence long-term economic outcomes.

Diverting a little from the time series, Domenech et al. (1997) beamed their search light on the impact of budget deficit on national savings using panel data from samples of OECD countries. Their study concluded that the Ricardian equivalence is non-existent since private savings represented only a fraction of the public savings triggered by the crowding-out effects of the private sector by the government.

Castro and Fernandez (2013) aimed at testing the validity of the Ricardian exposition within the Spanish confinement. The study adopted both structural consumption equations and consumption function stemming from the Euler equation derived through optimization. Using both time series and survey data, their results did not validate the Ricardian proposition. In line with the discovery in Spain, it is obvious that private consumption is not a function of the fiscal deficit; and as such, the fiscal policy instruments are ineffective.

Contrary to the above findings, the study by Ezeabasili and Egbunike (2014) relied on the marginality approach to regression analysis to ascertain the relationship between fiscal deficit and private saving in Nigeria using data between 1970 and 2006. The study concludes that an increase in government expenditure and fiscal deficit reduces private consumption. Thus, the result validates the Ricardian equivalence, which might be because the study emphasized on long-run analysis as well as the assumption that government fiscal deficits do not alter the political process.

A study by Amaghionyeodiwe and Akinyemi (2015) re-examines whether budget deficit and current account deficit can co-integrate in an oil-dependent economy, using a multivariate Granger causality test within the VECM framework. The study confirmed the existence of a long-run relationship between budget and current account deficit in Nigeria, and as such it supports the Mundell-Fleming theory. Also, the study exerts that there is a unidirectional causality running from budget deficit to current account balance. This might be because of the argument that oil-dependent states are usually subject to higher fiscal deficits resulting from external shocks in oil-price (see IMF 2019).

Contrary to the above literatures, a research by Abada (2016) using time series data for Nigeria covering over 37 years strived to confirm the relationship between government debt and public expenditures. Using the autoregressive distributed lag (ARDL) technique, the study concluded that the Ricardian equivalence hypothesis do not exist in Nigeria. However, Nkalu et al. (2016) carried out a study that focused on the re-examination of the validity of the Ricardian equivalence using time series data sourced from the World Economic Outlook, the Central Bank of Nigeria, and Bank of Ghana publications within the periods 1970 to 2013. Employing a seemingly unrelated regression (SUR) and two-stage least squares (2SLS) techniques, they discovered that the Ricardian equivalence is valid in Nigeria and Ghana. This might arise from the estimation techniques and time period covered during the research.

Further, investigating the plausibility of the Ricardian equivalence hypothesis using foreign debt, tax revenues and government spending using the vector error correction model (VECM) technique, Saraswati and Wahyudi (2018) discovered that current tax revenue and current government expenditures do not influence or drive current and future private consumption in Indonesia between 1980 and 2016. Thus, the study concluded that the Indonesian data do not validate the Ricardian equivalence hypothesis because a government fiscal policy is not only impotent; households practiced finite horizon and were not altruistic.



Marzouk and Oukhallou (2016) employed the ordinary least square technique to examine the relationship between foreign debt and public consumption in Morocco using time series data for a 45-year period. The result reveals that changes in consumption are not only explained by foreign debt but by other factors besides government policy. Thus, the study found that the Ricardian equivalence hypothesis is validated in Morocco; hence supporting the conclusions by Kormendi and Meguire (1990), and the works of Nelson and Emmanuel (2016) conducted in Ghana. Deducing from the above findings, fiscal policy could be assumed to be potent, and the characteristics of households in Ghana are infinite and altruistic.

With the popularity of the survey technique, Hayo and Neumeier (2017) sampled 2000 German residents in 2013 to either validate or invalidate the Ricardian equivalence by adopting the multinomial logit regression. The authors found that there exist a mix of partial Ricardian and non-Ricardian behaviour among households in Germany. Observations reveal that the survey result is unique and robust because it attempts to capture directly each individual behavioural pattern, as well as provide understanding towards the Ricardian equivalence framework.

Nanshuwan and Omotunde (2017) conducted a study utilizing the ARDL/bounds test technique with quarterly data from 1985Q1 to 2014Q4 sourced from the Central Bank of Nigeria (CBN) bulletin 2015; and found that the relation between budget deficits and private savings in Nigeria is negative. Thus, their findings do not proffer support to the Ricardian equivalence. Interestingly, other studies that do not lay credence to the Ricardian equivalence hypothesis include: Adji and Alm (2016), and Moskari and Eita (2017) in Indonesia and Lesotho, respectively.

On the flipside, Pickson and Ofori-Abebrese (2018) conducted a research in five African countries (Botswana, Ghana, Gambia, Nigeria, and Kenya), adopting the real gross domestic output as one of the explanatory variables. The study found that a direct relationship exists between gross domestic output and public consumption within the study areas. Lastly, Ayunasta, Setiaji and Hakim (2020) utilized quarterly data from 1997Q1 to 2017Q4 to verify the existence of the Ricardian equivalence hypothesis in Indonesia. Employing the impulse response and variance decomposition methodologies, the paper discovered that foreign debt does not influence domestic current consumption. Based on this established premise, the authors concluded that the Ricardian equivalence hypothesis is not revalidated during the post-Asia financial crisis in Indonesia.

#### **4. Methodology and Model Specification**

The aim of this paper is to validate the Ricardian equivalence hypothesis and capture the dynamic relationship between fiscal deficit, aggregate savings and investment in Nigeria using time series data. The review of past empirical studies has shown that there are very few studies in this area of discourse that adopted VAR model (see Chang and Hsu (2009); and Amaghionyeodiwe and Akinyemi, 2015). This is because the VAR model has proven to be especially useful in describing the dynamic behaviour of economic and financial time series, and for forecasting (Wooldridge, 2006).

#### 4.1 Vector Auto-Regression (VAR) Model

The general P<sup>th</sup> order VAR model is specified as follows:

$$Y_t = a + \sum_{i=1}^p a_i Y_{t-i} + \varepsilon_{t-1} \quad (1)$$

Where  $Y_t$  refers to aggregate savings, fiscal deficit and investment measures,  $t = 1, \dots, T$  refers to the time-period,  $i = 1 \dots n$  refers to the lag numbers and  $\varepsilon_t$  is the error term. The functional form of the VAR model is written as:

$$AS = F(FD, INV) \quad (2)$$

$$AS_t = \varphi_{11} + \beta_{11} AS_{t-1} + \beta_{12} FD_{t-1} + \beta_{13} INV_{t-1} + \varepsilon_{1t} \quad (3)$$

$$FD_t = \varphi_{21} + \beta_{21} FD_{t-1} + \beta_{22} AS_{t-1} + \beta_{23} INV_{t-1} + \varepsilon_{2t} \quad (4)$$

$$INV_t = \varphi_{31} + \beta_{31} INV_{t-1} + \beta_{32} AS_{t-1} + \beta_{33} FD_{t-1} + \varepsilon_{3t} \quad (5)$$

From the system of equations above,  $AS$  represents aggregate savings,  $FD$  represents fiscal deficits, and  $INV$  represents investment.

#### 4.2 Unit Roots Test

Generally, macroeconomic time series data are stochastically trended, which is a problem that can be solved by differencing. Several tests can be used to verify the presence of unit roots in time series. This study adopts Phillip-Perron tests to check for the presence of unit roots in the aggregate savings, fiscal deficit, and investment time series data. Theoretically, the following unit roots specified as follows:

$$\Delta Y_t = \delta Y_t - 1 + \sum_{i=1}^m \beta_i \Delta Y_t + \mu_t \quad (6)$$

$$\Delta Y_t = \alpha_0 + \delta Y_t - 1 + \sum_{i=1}^m \beta_i \Delta Y_t + \mu_t \quad (7)$$

$$\Delta Y_t = \alpha_0 + \delta Y_t - 1 + \alpha_1 t + \sum_{i=1}^m \beta_i \Delta Y_t + \mu_t \quad (8)$$

Each of the model is applied depending on the properties of the series. Thus, if a series has no intercept and trend, model (6) is appropriate, while model (7) is more appropriate if it has intercept without trend. Model (8) is applicable if the series have both time trends and intercept. Stationarity test is important to check for short-run disequilibrium.  $Y_t$  represents any of the variables whose unit roots is being checked.

#### 4.3 Block Exogeneity Wald Test (Causality Test)

This type of causality was adopted from a similar study in Gebremariam (2018). Owing from the above, it is important to ascertain the direction of causality between aggregate savings, fiscal deficit, and investment. The Block Exogeneity Wald test model is of the form:

$$AS_t = C + \sum_{i=1}^p \alpha_{1i}AS_{t-i} + \sum_{i=1}^p \alpha_{2i}FD_{t-i} + \sum_{i=1}^{Y_t} \alpha_{3i}INV_{t-i} + \varepsilon_{1t} \quad (4.9)$$

$$FD_t = C + \sum_{i=1}^p \beta_{1i}FD_{t-i} + \sum_{i=1}^p \beta_{2i}AS_{t-i} + \sum_{i=1}^{Y_t} \alpha_{3i}INV_{t-i} + \varepsilon_{2t} \quad (4.10)$$

$$INV_t = C + \sum_{i=1}^p \beta_{1i}INV_{t-i} + \sum_{i=1}^p \beta_{2i}AS_{t-i} + \sum_{i=1}^{Y_t} \alpha_{3i}INV_{t-i} + \varepsilon_{3t} \quad (4.11)$$

This is referred to the Toda-Yamamoto causality test. Following the intuitive notion for instance, if a group of variable  $FD_t$  is found to be significant for predicting another variable or group of variables  $AS_t$  then  $FD_t$  is said to Granger-cause  $AS_t$  otherwise it is said to fail to Granger-cause  $AS_t$ .

**5. Empirical Analysis**

Here, the study conducted series of tests and diagnostics in the following order: units roots test (Phillip-Perron), Johansen cointegration test, Granger-causality, vector auto-regression estimation and the impulse response function.

**Table 1: Units Root Test (Phillip-Perron)**

Variable	Coefficient	t-test	Prob-Value	Level of Integration
DFISD	-1.6301	-11.225	0.0001	I (1) *
DGINV	-0.9200	-4.8707	0.0004	I (1) *
DGSAV	-1.5616	-8.7435	0.0000	I (1) *

Source: Authors' computations 2020

\* significant at 1% level

The units root test in Table 1 exhibits the fact that all the variables that are factored into the VAR model were significant at order one. This is the first condition for the VAR estimation. The second condition is that the variables must be co-integrated. Thus, the cointegration test result is presented in Tables 2 and 3.

**Table 2: Johansen Cointegration Test**

Null Hypothesis	Eigenvalue	Trace Statistic	Critical Value	Prob. Value
<b>Panel A: Trace Test</b>				
NONE	0.9342	78.8118	29.7971	0.0000
AT MOST 1 *	0.2157	8.0657	15.4947	0.0458
AT MOST 2	0.0651	1.7490	3.8415	0.1860
<b>Panel B: Maximum Eigenvalue</b>				
NONE	0.9342	70.7461	21.1316	0.0000
AT MOST 1 *	0.2156	6.3167	14.2646	0.0503
AT MOST 2	0.0651	1.7490	3.8415	0.1860

Source: Authors' computation, 2020

\* indicates two co-integrating equations at the 0.05 level

Examining Panel A in Table 2 it is obvious that the Johansen cointegration test (trace test) supports the fact that the variables are co-integrated in the long-run. From this result, it could be concluded that at least two equations are co-integrated. The above notwithstanding, the result of the maximum eigenvalue cointegration test further supports the above conclusion. This is because the probability value of “At most 1” is less than 5 percent, which supports the conclusion that two co-integrating equations exist. Given the above, the study conducts a causality test using the Granger/block exogeneity test. This is presented in Table 3.

**Table 3: Granger/Block Exogeneity Test**

Panel A: Dependent Variable: DGSAV				Panel B: Dependent Variable: DGINV			
<i>Excluded</i>	<i>Chi-Sq</i>	<i>Df</i>	<i>Prob.</i>	<i>Excluded</i>	<i>Chi-Sq</i>	<i>df</i>	<i>Prob.</i>
DGINV	4.5891	2	0.0108*	DGSAV	0.2805	2	0.8692
DFISD	7.4727	2	0.0238**	DFISD	0.0209	2	0.0099*
All	15.1359	4	0.0044*	All	11.4891	4	0.0216**

Source: Computed by authors, 2019 \* , \*\* represent 1% and 5% levels of significance

The Granger causality test in Panel A exerts the fact that gross investment and government fiscal deficit Granger cause gross savings; and the results are significant at 1 percent and 5 percent levels respectively. Also, the combination of gross investment and government fiscal deficits Granger cause gross saving at 1 percent levels of significance. In furtherance to the above, the result in Panel B of the Granger causality test shows that government fiscal deficit Granger cause gross investment at 1 percent levels of significance. Although, gross savings does not Granger cause gross investment, the combination of gross savings and government fiscal deficit Granger cause gross investment at 5 percent levels of significance. Owing to the above, the lagged values of government fiscal deficit can explain and forecast changes in both gross savings and investment. On the flipside, government fiscal deficit Granger cause both gross savings and investment.

**Table 4: VAR Lag Order Selection Criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-652.4372	NA	1.11e+13	38.55513	38.68981	38.60106
1	-551.5571	178.0237*	5.02e+10*	33.15042*	33.68913*	33.33413*
2	-547.0523	7.154698	6.64e+10	33.41484	34.35759	33.73634
3	-540.2274	9.635029	7.82e+10	33.54279	34.88958	34.00208

Source: Author's computation, 2020 \*Represents that the lag 1 is significant

The result presented lag lengths from zero to three. However, it is only the lag length one that is significant based on the dictates of the likelihood ratios, Akaike information criterion, Schwartz criterion, and Hannan-Quinn criterion. The lag length one is significant and so provides information on the expected lag(s) of the variables to be included in the model for the purpose of the regression analysis. The next is the presentation and interpretation of the vector autoregression results which is presented in Table 5.

Table 5: Vector Auto-regression Estimates

Variables	DGSAV	DFISD	DGINV
DGSAV(-1)	2.557442 (1.27999) [1.99802]	2.364246 (1.04760) [ 2.25682]	-0.019615 (0.66804) [-0.02936]
DFISD(-1)	-3.180537 (1.31742) [-2.41421]	-2.949549 (1.07824) [-2.73553]	-0.024766 (0.68758) [-0.03602]
DGINV(-1)	-2.065706 (1.34577) [-1.53496]	-2.167985 (1.10144) [-1.96831]	0.306171 (0.70238) [0.43591]
<b>R-Squared 0.6773</b>		<b>Mean Dependent 2.37E+09</b>	
<b>Akaike Crit. 50.0548</b>		<b>S.D. Dependent 2.50E+10</b>	

Source: Authors' computation, 2020

The result in Table 5 represents the vector autoregression (VAR) estimate that shows the interrelationships between fiscal deficits, aggregate savings, and investment. Conventionally, because households are rationally expectants, they can predict long run effects of fiscal policy (tax cuts or increased spending). For instance, fiscal expansion (tax cut) increases private savings, reduces interest rate, and causes investment to up-shoot. This triggers long-run increment in aggregate demand. However, in the short-run, Say's law for deficits applies; where demand for bonds rises to match government borrowing, reduces aggregate savings, increases interest rate and as such reduces investment, which forces aggregate demand to fall. Since deficit fails to stimulate aggregate demand, then fiscal policy becomes impotent.

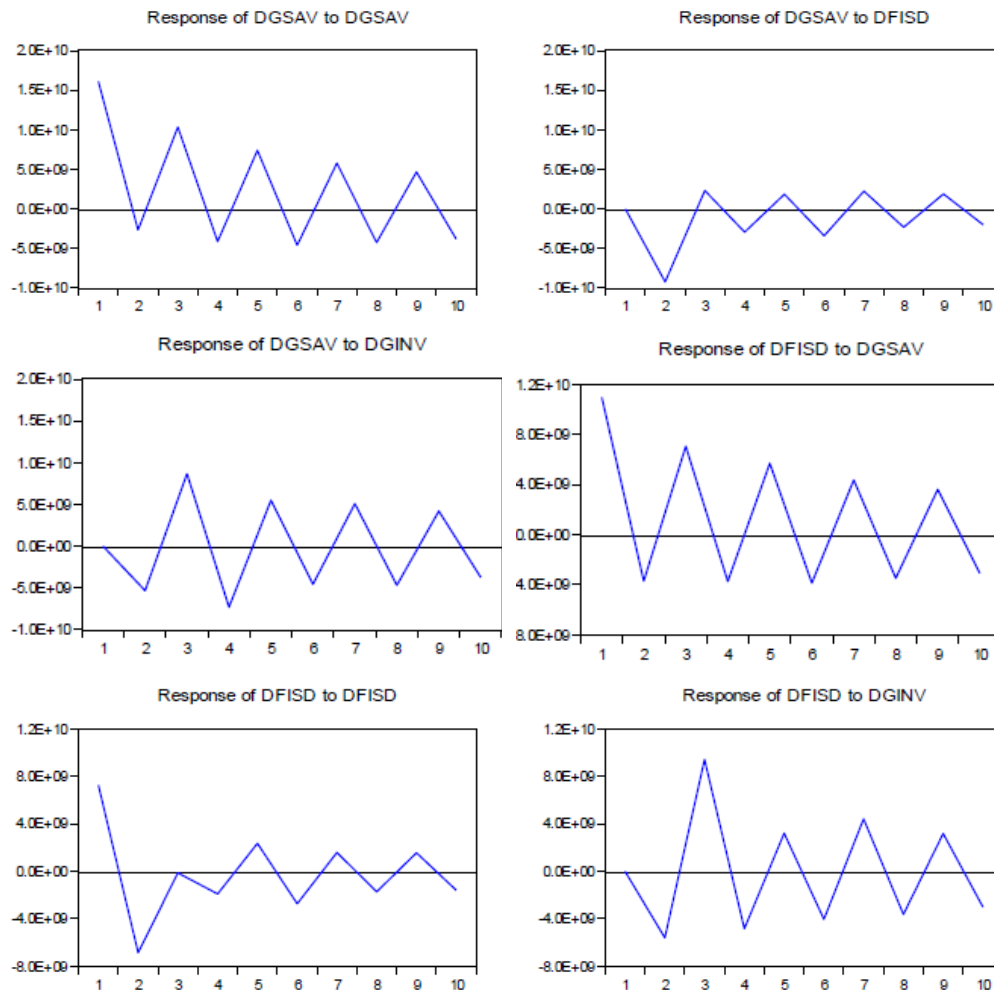
Building on this established premise, the result above shows that a unit change in government fiscal deficit reduces gross savings by 3.18 units, holding other variables constant. This result does not support the Ricardian equivalence hypothesis, which stipulates that an increase in fiscal deficit leads to corresponding increase in gross saving because consumers are rational and have an infinite consumption horizon. This finding is in tandem with the works of Khalid (1996), Castro and Fernande (2013) and Nanshuwan and Omotunde (2017). Drawing from the above, the study therefore concludes that household's saving behaviour in Nigeria do not support the Ricardian equivalence. Also, the result above is significant at 5 percent levels.

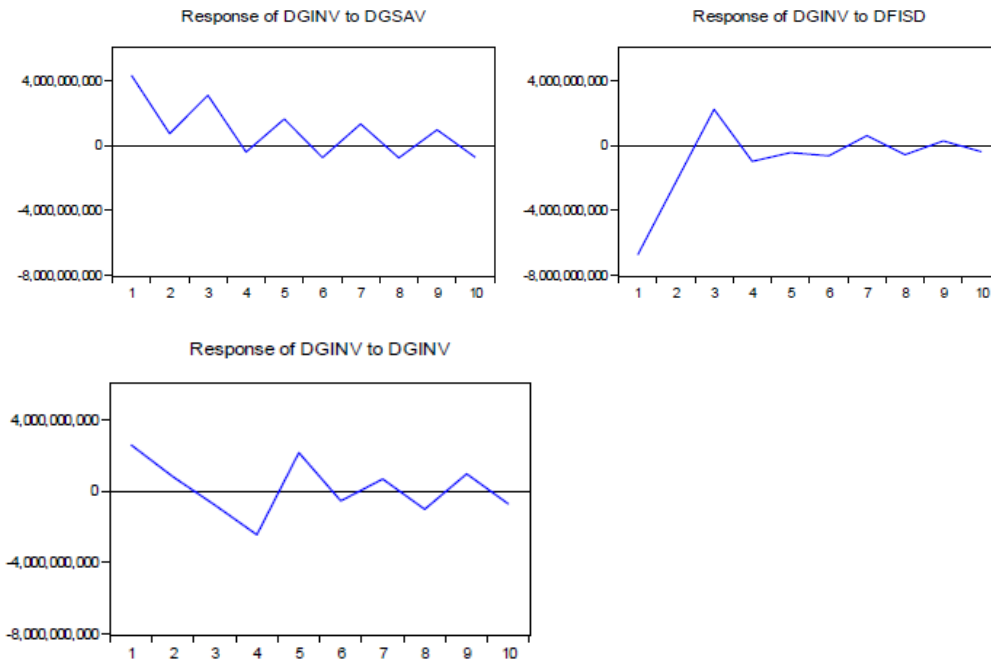
Further, the result reveals that a unit increase in fiscal deficit would reduce investment by a 0.025 unit, holding other variables constant. Thus, these results uphold the neoclassical literary arguments that economic growth is retarded due to crowding-out effects resulting from fiscal deficit (Nkalu et al., 2016). In addition, the value of the R-squared is 0.6773, which concludes that approximately 68% of variation in the dependent variables are explained by the variables within the model. Hence, only 32% of variations in the model are explained by the random stochastic term. This means that the model is robust and in good-fit.

Lastly, the impulse response function (IRF) helps to validate and strengthen the robustness of this analysis. Here, the study utilized the IRF to examine the dynamic interaction between fiscal deficit, gross savings, and investment. Therefore, it traces the effects of one-time shock to one of the innovations on current and future values of endogenous variables. Figure 1 presents the impulse responses to shock in fiscal deficit, gross savings, and investment.

We can deduce from the Figure 4 that the response of gross saving to shocks in government fiscal deficit has a sharp negative fall from period one and two; but at period three there was a sharp positive response, a little above the horizontal for gross saving as a result of shocks from government fiscal deficit. At period four, gross saving experienced a negative response because of shocks from the fiscal deficit.

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**Figure 4: Impulse Response Graphs**

Between period four and period ten, the response of gross saving to shocks in fiscal deficit alternated steadily between negative and positive up to period ten. On the contrary, the response of gross investment to shocks in fiscal deficit experienced a sharp positive movement from negative axis to the positive axis from period one to period three. Although at period two the response of gross investment to shocks in fiscal deficit was neutral, the response moved to the positive axis mark at period three. However, between period four and six, the response of gross investment to changes in fiscal deficit was not marginal and as such remained at the negative axis. Despite the above, in period seven, gross investment had a marginal positive incremental response from negative to positive because of shock from fiscal deficit. Hence, at period eight the response of gross investment to shocks in fiscal deficit was negative, but at period nine and ten the response of gross investment to shocks in fiscal deficit remained neutral.

**6. Summary and Concluding Remarks**

A review of this study exerts the fact that although volumes of research have been conducted in developed economies, however, not much effort have been channelled towards explaining the nexus between fiscal deficits, gross saving and private investment in less developed countries and the emerging economies. Based on this empirical analysis, appropriate policies can be formulated by providing insights on how fiscal deficit can execute its roles without essentially leading to inflationary pressure. For instance, the results arising from this study evidently shows that

fiscal deficits in Nigeria are triggered by macroeconomic imbalances. For instance, a fall in gross saving triggered by steady increase in fiscal deficit are not desirable for economic growth. Instead, they could be source of disaster if they attain unsustainable levels. Unfortunately, fall in aggregate saving discourages investment since it stimulates interest rate to sky-rocket. Similarly, high interest rates would therefore crowd out the private sector and thus, negatively affect national savings, investment, and lower growth potentials.

In conclusion, the empirical results show that the Ricardian Equivalence Hypothesis (REH) do not hold for the Nigerian economy. As a result, it is therefore pertinent for policy-makers and government representatives to maintain fiscal deficits benchmark of less than 40% of GDP as recommended by the International Monetary Fund (IMF) (see IMF, 2019). This is because as the fiscal deficit exceed this benchmark, it causes macroeconomic conditions to weaken and as such encourages poor economic performance. Further, although expansionary fiscal policy (tax cuts and increased government spending) stimulates economic growth, however, the government should focus mainly on the expansion of the fiscal capital space whose multipliers effect is exponential. This will counter the effects of households' proposed behaviour of increasing savings rather than expenditures during expansionary fiscal policy.

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