



## Budget Deficit and Economic Growth in Sub-Saharan Africa: A PMG Approach

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### *Authors' contributions*

*This work was carried out in collaboration between both authors. Author GOA designed the study and performed the statistical analysis. Author IOE managed the analyses of the study, literature searches, wrote the protocol and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.*

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### ABSTRACT

The relationship between budget deficit and economic growth remains one of the widely debated topics among policy makers and economists in both developed and developing countries of the world. This paper empirically investigated the long run and short run relationship between budget deficit and economic growth in sub-Saharan Africa countries from 1991 to 2018 using Panel data for twenty (20) sub-Saharan Africa Countries. The estimation technique employed in the study was the Pooled Mean Group (PMG) estimation method and the regression results revealed that in the long run, budget deficit has a negative and significant relationship with economic growth whereas in the short run, it has a positive and significant relationship with economic growth. The study concluded that government should reduce the overall recurrent expenditure as it will help to mitigate the problem of budget deficit that leads to debt accumulation in sub-Saharan Africa countries and increase expenditure on developmental projects.

*Keywords: PMG; budget deficit and economic growth.*

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## 1. INTRODUCTION

Budget deficit is one of the economic problem facing both developed and developing countries/economies. There have been incidence of large government deficit in sub-Saharan Africa since the late 1970s and this has generated a controversial issue among policymakers and economists [1].

A budget deficit occurs when the expected expenditures exceed the expected revenue. Governments' expenditures include money spent on all projects regardless of the goal of these projects such as transportation, education, defence, and civil administration to mention a few. Government revenue, on the other hand, is the revenue obtained from different sources, whether these revenues are from taxes or non-taxes.

Governments finance budget deficits through various sources and this involve domestically borrowing (often used in developed countries with domestic financial systems), borrowing from the World Bank or the International Monetary Fund (IMF) (i.e. International sources), and minting currency by the central bank (i.e. monetary financing) and through foreign aid from different agencies and donor governments [2]. The effect of budget deficits on the economy to a large extent depends on how it is financed. If the government deficit is financed by borrowing from commercial banks, the effect will be an increase in the interest rates, thereby leading to crowding out of private investors. If the government deficit is financed by money creation or borrowing from the central bank (i.e. monetary financing), the effect is that it is likely to lead to inflation. Financing deficit by externally borrowed funds; the adverse effect will be the appreciation of the exchange rate resulting from the inflow of foreign exchange which will affect the performance of exports leading to the deterioration of the current account balance. It can also lead to growth in the country's external debt stock which could result in a debt crisis [3].

Issues about the macroeconomic effects of budget deficit are addressed by three schools of thought, namely, the Neo-classical, Keynesian and Ricardian. The Neoclassical school of thought is of the opinion that budget deficit has a negative effects on economic growth, causing real interest rates to grow and private investments to crowd out of the economy. It further argues that debts must be repaid, and

it will, therefore, be a burden on future generations.

The Keynesians believes that budget deficit has a positive effect on the economy emphasizing thus the multiplicative economic effects of budget deficit, or the "crowding-in" effect. Keynes stated that the government use budget deficit to stimulate demand in the economy in times of recessions and depressions. The school of thought states that the increased size of the market, due to government deficits, can stimulate the economy by raising business profitability and spurring optimism, which encourages private fixed investment in factories, machines, and the like to rise. This accelerator effect stimulates demand further and encourages rising employment.

The Ricardian equivalence theory stated that budget deficit does not have any direct effect on the economy. Barro [4] posited that because increased public consumption has to be paid, the reduced taxes in the current year must correspond with the same increase in the present value of future taxes thereby leaving public consumption and interest rates unchanged.

From the foregoing, there are diverging views on macroeconomic implication of budget deficit in the literature as the relationship between budget deficits and macroeconomic variables such as growth, unemployment rate, exchange rate, inflation rate, etc. could be negative, positive or may not be either.

Aero & Ogundipe [5] asserted that when government expenditure increases due to productive expenditure like education and health care, budget deficits can bring about economic growth in the long run. However, there is always a need for government to undertake very useful measures aimed at shaping the economy and budget deficit is one of such measures.

Fiscal policy in some SSA countries has been expansionary, and the outcome is vulnerability to external shocks. As a result of this, over one-third of SSA countries have been experiencing budget deficit after the global financial crisis of 2008/2009 and this has led to debt accumulation by oil exporting countries, middle-income countries as well as low-income SSA countries. For example, the rate of change of public sector debt between the year 2007 and 2012 in the oil-exporting SSA countries includes Chad 26 per cent, Nigeria 12.7 per cent, and

Angola 21.4 per cent. For the middle-income countries, the rate of change in public debt in Senegal was 23.5 per cent, South Africa 25.4 per cent, Ghana 31 per cent, Cape Verde 73.9 per cent, Mauritius 56.2 per cent, Lesotho 50.6 per cent, while for low-income countries include Malawi 41 per cent, Tanzania 40.6 per cent, Sierra Leone 43.2 per cent and Ethiopia 43.5 per cent [6].

Increasing budget deficits have become common features of most developing countries, and the economic consequences of such deficits as seen in empirical literature are inflation, devaluation of currency, deteriorating gross domestic product, fiscal adjustment, which constitute important element of the economic agenda [7]. Deficits are often attributed to high government expenditure and caused by rising public spending over and above public revenue. Easterly & Schmidt-hebbel [8] also argued that a significant part of the economic problems-such as unsustainable debts, high inflation, low levels of investment and economic growth experienced by developing countries since the 1980s have been attributed to the sustenance of fiscal deficits.

Ariyo & Sunday [9] asserted that budget deficit is not necessarily an issue, but its persistent growth in both developed and developing countries have made it an issue of discourse.

This study therefore examines the long run and short run effect of budget deficit and economic growth in twenty SSA countries from 1991 to 2018 using the pooled mean group estimation technique. The period was chosen based on the availability of data, while twenty (20) SSA countries were selected based on their income group. That is six countries from the upper-middle-income countries, seven lower-middle-income countries and seven low-income countries. The countries are Namibia, Botswana, Gabon, Mauritius, Equatorial Guinea, South Africa, Angola, Nigeria, Ghana, Kenya, Senegal, Eswatini, Lesotho, Togo, Rwanda, Uganda, Tanzania, Ethiopia, Burkina Faso, and Benin.

## **2. LITERATURE REVIEW**

### **2.1 Theoretical Review**

Generally, there are three major theories concerning the macroeconomic effect of budget deficit. They are; The Keynesian theory, Neoclassical theory, and Ricardian theory.

The Keynesian theory of budget deficit was propounded by British economist John Maynard Keynes. The theory states that there is a positive relationship between budget deficits and macroeconomic variables. The Keynesians stated that increasing budget deficit will lead to an increase in aggregate demand and improve investor's confidence on the economy's potential, thereby fostering investments and aggregate savings which results in economic growth in the long run.

The Keynesians posited that budget deficits result in a rise in domestic production, which makes investors optimistic about the future course of the economy resulting in them investing more. This is known as the "crowding-in" effect. The traditional Keynesian view differs from the standard neoclassical paradigm in two fundamental ways. First, it permits the possibility that some economic resources are unemployed. Second, it presupposes the existence of a large number of liquidity-constrained individuals. This second assumption guarantees that aggregate consumption is very sensitive to changes in disposable income. Eisner [10] asserted that an increase in the level of aggregate demand will improve the level of profitability of private investments which will bring about a rise in the level of investment at any given interest rate. Hence deficits may stimulate aggregate savings and investment, even though they raise interest rates. He concludes that "evidence is thus that deficits have not crowded-out investment. There has rather been crowding-in".

However, Keynesian paradigm, with respect to high government expenditure, was challenged empirically, when it couldn't to explain the world economic recession in 1970s and the boom in 1980s while Phillips [11] also pointed that though budget deficit can lead to increased economic activity and low level of unemployment, there is an unintended consequence in the form of a higher level of inflation in the economy.

The Neoclassical theory postulated that budget deficit has an inverse relationship on macroeconomic variables. They stated that budget deficit leads to a rise in interest rates, which discourages the issue of private bonds, private investments and therefore results to a rise in the level of inflation, and adversely affecting the level of economic growth due to crowding out of resources. They further stated that budget deficit will leave a huge tax burden

on future generation because borrowed funds will need to be repaid.

The neoclassical theory has three main assumptions, which are that the consumption of individuals is determined as the solution to an inter-temporal optimization problem, where both borrowing and lending are permitted at the market rate of interest. Secondly, individuals have finite lifespan such that each consumer belongs to a generation, and the lifespan of successive generations overlap. Thirdly, market clearing is generally assumed in all periods.

However, the neoclassical paradigm does not tie down the effects of temporary deficits, and evidence that bears on the effects of temporary deficits is not useful for testing this paradigm. The fundamental lessons of the neoclassical framework have to do with the effects of permanent deficits.

The Ricardian Equivalence theory was postulated by David Ricardo but was later completed by Barro [4]. The theory posits that budget deficit has no effect on the economy. They stated that an increase in budget deficits will be repaid either now or in future because a cut in taxes today must be matched by future increase in taxes thereby leaving real rate of interest, private investment, exchange rate and domestic production unaffected [12,13].

The theory is based on two assumptions which are the assumption of rational expectations and household taxation which states that as budget deficit increases through borrowing, and as taxes reduce, the government will not increase future taxes to repay the interests and debts. Also, they believe that people found out by experience that increase in government bond as a result of decrease in taxes offers temporary revenue for the individual at the present time and as the debt of government continues to rise, people will save more so as to provide higher tax paying in the future. Therefore, increased public saving offers more credit to families and economic enterprises. As a result, increased loan demand by government would be compromised by higher saving; therefore, interest rate remains unchanged, and the decrease in taxes may not lead to permanent revenue, households save temporary income with no change in order to pay the future tax liabilities, in term of savings, caused by current tax cuts.

The Ricardian equivalence theory was criticized by Feldstein [14] as he stated that Barro ignored economic and population growth in his study stating that the creation of public debt depresses savings in a growing economy.

## 2.2 Empirical Review

Several studies have been conducted on the relationship between budget deficit and economic growth. Empirical findings as regards the relationship are however conflicting and inconsistent. Cinar, Eroglu, & Demirel [15] examined the effect of budget deficit policies on economic growth. The study used the 2001Q1–2011Q4 data on the best five (Panel A) and five worst (Panel B) countries in European Union by their debt levels and used the panel ARDL model. The findings showed that there is a short-run negative relationship between public debt and economic growth for the two groups of countries while the long-run estimation results showed budget deficit policies did not affect economic growth in Panel A and B. The finding of the study however is contrary to that of Despotović & Durkalić [16] who analysed the impact of budget deficit on European Union membership countries. Their study was for the period 2000 to 2015 and their findings however showed that in the pre-crisis period (2000 - 2007), public debt grew both in the EU and in candidate countries, Albania, Bosnia, Hercegovina & Serbia. Also, after the crisis, the correlation remained strong & positive in all countries except Turkey.

Saleh & Harvie [17] examined the impact of the budget deficit on key macroeconomic variables in the seven major industrial countries (G-7): Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. The period of study was from 1964 to 1993 and multiple regression analysis, as well as meta-analysis was used to analyse the data. The multiple regression results indicated that the budget deficit led to higher short-term interest rates in Japan and the United States. Concerning the long term interest rate, the budget deficit led to an increase in this rate in France, Germany, and the United States. The budget deficit, however, appeared to worsen the trade balance in Canada. For economic growth, the budget deficit was a significant variable of growth in France, Germany, and Italy. The budget deficit, however, did not manifest any impact on the long-term interest rates.

Molocwa, Khamfula, & Cheteni [18] examined the political economy of budget deficits among the BRICS nations (Brazil, Russia, India, China and South Africa) between 1997 and 2016 using a panel cointegration approach to determine the long-run relationship between economic growth, budget deficits, inflation and gross investment. The results of the study showed a long-run equilibrium association between economic growth and the selected variables. Furthermore, there is a positive relationship between budget deficit, inflation, and economic growth, for the period under study for BRICS countries. Lastly, the results support the view that there is a bi-directional linkage from budget deficit to economic growth and vice versa.

Salotti & Trecroci [19] investigated the impact of government debt, expenditure and taxes on aggregate investment and productivity growth in OECD for the period 1970 to 2009. The study employed the panel fixed effect estimation method as well as the generalized method of moments. The findings showed that high public debt adversely affect both aggregate investment spending and productivity growth through distortions related to the size of the economy.

Iqbal, ud Din, & Ghani [20] examined the relationship between fiscal deficit and economic growth in Pakistan to determine if there is a threshold level of fiscal deficit that could serve as a policy benchmark in promoting growth through fiscal expansion. The analysis applied the STAR model to time-series data for the period 1972 to 2014. The study revealed that fiscal deficit has a negative impact on economic growth. Similarly, Nayab [21] examined the impact of budget deficit on economic growth in Pakistan during the period 1976 to 2007. The vector error correction model was used in the study while the result revealed that there was no significant impact of the budget deficit and economic growth of Pakistan. Furthermore, Jalil et al. [22] investigated the impact of fiscal deficit and inflation in Pakistan. The study covered the period 1972 to 2012. The study employed the autoregressive distributed lag model and the findings revealed that fiscal deficit is a major determinant of the price level along with other variables like interest rates, government sector borrowing and private borrowing. Also, on the basis of the findings, the paper suggested that the economy of Pakistan requires an immediate correction of fiscal imbalances.

Tung [23] examined the effect of fiscal deficits on economic growth in Vietnam. The study applied

the Error Correction Model on the quarterly data of 2003 to 2016. The empirical results strongly indicate there is a cointegration relationship between fiscal deficit and economic growth in Vietnam, in which fiscal deficit had harmful effects on economic growth in both the short and long run. In particular, the correlation analysis confirmed that fiscal deficit can hurt not only the gross output but also private investments, foreign direct investments, and net exports.

Epaphra [3] examined the causal relationship between budget deficits and macroeconomic fundamentals namely real GDP growth rate, the rate of inflation, interest rate, money supply and real exchange rate in Tanzania. The VAR-VECM and variance decomposition methods were applied to examine the causal relationship among the macroeconomic variables. The study employed time series annual data spanning from 1966 to 2015. The results of the cointegration test showed that a long-run relationship exists among the macroeconomic variables. The VECM and variance decomposition results showed that budget deficits and real GDP are negatively correlated, and that budget deficit and the rate of inflation and money supply are positively correlated.

Edame & Okoi [24] examined the impact of fiscal deficits on economic growth in Nigeria during the military and democratic regimes. The study employed Chow endogenous break test, unit root and cointegration tests. The study found that fiscal deficit had a significant growth impact during the military regime, while it has not had a significant impact on economic growth during the democratic regime. Similarly, Aero & Ogundipe [5] also investigated the effects of fiscal deficits on economic growth in Nigeria for the period 1981 to 2014 using the Threshold Autoregressive (TAR) model. The study found out that a significant negative relationship exists between fiscal deficits and economic growth. The study however concluded that the Nigerian economy has been characterized by continuous fiscal deficits, which has not positively contributed to economic growth. Contrarily, Ubi & Inyang [25] descriptively appraised the implication of fiscal deficit on Nigeria's economic development from 1980 to 2016. The study disclosed that Nigeria's fiscal deficit has contributed positively to the growth of per capita income, economic growth and stabilization of balance of payments only but did not reduce unemployment and inflation rates. Furthermore, Oyeleke & Ajilore [26] investigated the sustainability of fiscal policy in Nigeria for the period 1980-2010. The study employed the error

correction method and the findings revealed that fiscal policy was weakly sustainable in the economy of Nigeria.

Kelikume [6] examined the effect of government deficit on interest rates in sub-Saharan Africa. The study applied Panel Vector Auto regression techniques (PVAR) on dataset collected from 18 countries across Sub-Saharan Africa (SSA) over the period 2000 to 2014. The result showed that interest rate respond neutrally or insensitively to government fiscal deficit. The finding of the study is in line with the Ricardian Equivalence theory.

Chen [27] examined budget deficits and interest rates in Japan for the period 1972 to 2010. He employed the generalized autoregressive conditional heteroskedasticity test and the finding revealed that a higher government deficit as a percent of GDP leads to a lower long-term interest rate in Japan. In addition, the real money market rate, the GDP growth rate, the expected inflation rate, the world long-term interest rate, and the expected depreciation of the yen have positive effects on the Japan's long-term interest rate. Finally, inclusion of the world interest rate and the exchange rate in the model may better capture the behaviour of the long-term interest rate in Japan.

Kim & Roubini [28] investigated the effect of government deficits on the real exchange rate and current account in America for the period 1973 to 2004 using the VAR estimation method. The study's findings revealed that increasing government budget deficit shock improves the current account and depreciates the real exchange rate. They stated that a rise in private savings and decrease in investment contribute to the current account improvement while the nominal exchange rate depreciation, as opposed to the relative price level changes, is mainly responsible for the real exchange rate depreciation. They further argued that the reason for the evidence of twin divergent in the US was because of its relatively closed open economy, which increases the level of private savings. A fiscal expansion may lead to an increase in real interest rate, which in turn crowd out private investment but stimulate private savings. Furthermore, Grier & Ye [29] examined twin deficits in America due to the fact that previous studies didn't consider structural breaks. The period of the study was 1948 to 2004 and the findings showed that there is the presence of two breaks in the current account deficits which occurred in the fourth quarter of 1982 and the

second quarter of the year 1999, while there is a one break presence of budget deficit which happened in the second quarter of the year 1974. Also, in the long run, there's no relationship between budget deficit and current account deficits, while there is a relationship in the short run.

Ramu & Gayithri [30] examined the long run and short run relationship between budget deficit and economic growth in India. The period of study was 1970 to 1971 and 2011 to 2012 using the vector error correction estimation method. The findings however showed that budget deficit inversely affects gross domestic product and the effective fiscal deficit enhances capital formation directly and indirectly encourages the private sector to invest more.

Arjomand, Emami, & Salimi [31] studied the effect of growth, efficiency and government budget deficit in MENA selected countries within the period 2000 to 2013, using the static panel models. The result of the estimated relations for the first model in which government budget deficit is the dependent variable indicate positive effect of economic growth and inflation rate variables as well as the negative effect of labour productivity and government budget deficit. Moreover, the second model in which economic growth is the dependent variable demonstrates the positive effect of labour productivity index and economic growth. In addition, negative correlation of government budget deficit with economic growth is also maintained.

### 3. METHODOLOGY

This study obtained panel data from the International Financial Statistics (IFS), Government Finance Statistics (GFS) and the Balance of Payment Statistics (BOPS) of the International Monetary Fund as well as the World Bank Development Indicators and the African Development Bank Indicators for the period 1991 to 2018 while twenty SSA countries were chosen based on their income group and data availability. The countries are Namibia, Botswana, Gabon, Mauritius, Equatorial Guinea, South Africa, Angola, Nigeria, Ghana, Kenya, Senegal, Eswatini, Lesotho, Togo, Rwanda, Uganda, Tanzania, Ethiopia, Burkina Faso, and Benin. The data was analysed using Eviews10 and Stata14.

$$Rgdp = f(Bd) \quad (1)$$

$$Rgdp_{it} = \alpha_0 + \alpha_1 Bd_{it} + U_{it} \quad (2)$$

Budget deficit is a significant variable influencing output growth rate. This variable is especially significant for most developing countries including SSA countries where fiscal discipline plays very important role. An increase in budget deficit will stimulate the demand thereby leading to increase in employment which will stimulate growth. We expect to get a positive relationship with output growth.

$$\begin{aligned} \text{A priori expectation: } \alpha_1 > 0 \\ \Delta LRgdp_{i,t} = \beta_0 + \beta_1 LRgdp_{i,t-1} + \beta_2 Bd_{i,t-1} + \\ \sum_{i=1}^p \alpha_1 \Delta LRgdp_{i,t-1} + \sum_{i=1}^p \alpha_2 \Delta Bd_{i,t-1} + U_{it} \quad (3) \end{aligned}$$

Where:

Rgdp: Real gross domestic product  
Bd: Budget deficit as a percentage of GDP  
 $\Delta L$ : Change in the long-run variables  
 $i$ : SSA countries  
 $t$ : Number of years  
 $\beta_0$ : Constant  
 $\beta_1, \beta_2, \alpha_1, \alpha_2$ : Regression coefficients  
 $U_i$ : Stochastic error term  
 $t - 1$ : Lag period  
 $\sum_{i=1}^p$ : Captures the short-run impact of budget deficit on macroeconomic performance in SSA countries.

#### 4. DATA PRESENTATION AND ANALYSIS

The characteristics of the data used in this analysis are presented in the Table 1.

GDP in Africa has grown in real terms every year since 2009. In the year 2013, Africa was identified as the world's fastest-growing continent at 5.6 per cent a year and GDP rising by an average of over 6 per cent a year. In 2017, the

African Development Bank reported Africa as the world's second-fastest-growing economy and estimates that average growth will rebound to 3.4 per cent in 2017, while growth increased by 4.3 per cent in 2018 [32].

Also, the SSA region witnessed mixed and most of the times, low annual growth during the review periods. The annual GDP of some SSA countries grew on the average by 3.13 per cent from 1991 to 2013. The region recorded the highest growth of 5.64 per cent in 2004 and the lowest of negative 0.71 per cent in 1992. Drivers for the growth included: implementations of various structural reforms; solid global demand for commodities; greater flows of capital in the region; and debt relief. With the global economic crises in 2008, economic growth faltered in many economies due to prolonged crisis in the world economy that caused the contraction in the global GDP first time after a long period of global stability. The GDP growth rate of the region thus reduced from an average of 4.05 per cent from 2000 to 2007 to 2.1 per cent in 2009 [33].

The mean value of the descriptive statistics result simply shows the average value for each of the variables. For log of real gross domestic product, the mean value is 10.13, while it is -4.56 for budget deficit.

The median on the other hand shows the middle value for each of the variables. The median value for log of real gross domestic product is 10.08, while it is -2.56 for budget deficit.

The maximum and minimum value shows the highest and lowest figures in each of the variables. Log of real gross domestic product had the highest value of 11.67 and a lowest value of 8.33 whereas budget deficit has a maximum

Table 1. Real GDP Growth in Africa, 2010–20

Indicator and country group	2010 – 2014	2015	2016	2017	2018	2019P	2020P
Central Africa	5	3.3	0.2	1.1	2.2	3.6	3.5
East Africa	5.9	6.5	5.1	5.9	5.7	5.9	6.1
North Africa	3.7	3.7	3.2	4.9	4.3	4.4	4.3
Including Sudan	3.6	3.7	3.2	4.8	4.3	4.4	4.3
Southern Africa	3.8	1.6	0.7	1.6	1.2	2.2	2.8
West Africa	6.2	3.2	0.5	2.7	3.3	3.6	3.6
<i>Africa</i>	4.7	3.5	2.1	3.6	3.5	4	4.1
Excluding Libya	4.4	3.6	2.2	3	3.5	3.9	4.1
Sub-Saharan Africa	5.2	3.4	1.5	2.9	3.1	3.7	3.9
Excluding South Africa	5.9	3.9	1.8	3.3	3.6	4.2	4.3
Oil-exporting countries	4.7	3.3	1.5	3.2	3.4	3.8	3.7
Oil-importing countries	4.6	3.7	3.1	4.2	3.8	4.3	4.5

Source: African Development Bank Statistics and Staff Calculations

value of 21.80 and a minimum value of -557.50 respectively. This shows that there is a large difference between the values of the series, showing a significant variation in the trends of the variables over the period of study.

**Table 2. Descriptive statistics**

Variables	LRGDP	BD
Mean	10.13182	-4.55815
Median	10.08303	-2.5565
Maximum	11.67152	21.795
Minimum	8.331583	-557.499
Std. Dev.	0.610049	34.60699
Skewness	0.601478	-13.1831
Kurtosis	3.44627	191.0853
Jarque-Bera	38.41272	841662.4
Probability	0.000000	0.000000
Sum	5673.822	-2552.56
Sum Sq. Dev.	208.0375	669482.8
Observations	560	560

Source: Authors Computation, using E-views 10

The standard deviation shows the deviation from the sample mean with respect to each of the variables. That is, how far the observations are from each of the sample average. Log of real gross domestic product has a standard deviation of 0.61 while budget deficit has a standard deviation of 34.61 per cent.

Skewness measures the degree of asymmetry of the series and the result shows that LRGDP is positively skewed because it has a long right tail and higher values than the sample mean whereas budget deficit is negatively skewed because it have a long left tail with lower values than the sample mean.

The Kurtosis value of the distribution shows that all the variables are leptokurtic indicating that the

curve is positively peaked. This is because all the variables are greater than 3 (i.e. 3.45 & 191.09 > 3).

The Jarque-Bera statistics measures the difference between the skewness and the kurtosis of each of the variables with those from the normal distribution. The Jarque-Bera statistics for log of real gross domestic product and budget deficit are 38.41 and 841662.4 respectively.

The probability value is the probability that the Jarque-Bera statistic exceed (in absolute value) the observed value under the null hypothesis. A small probability value leads to the rejection of the null hypothesis of a normal distribution. We therefore reject the null hypothesis for the variables because the probability values are highly statistically significant indicating that the results are not normally distributed. This can be clearly seen from the Kurtosis and skewness values of the variables.

Table 3 illustrates the PMG, MG estimation results and Hausman test result of the estimation technique. The Hausman tests were run with the null hypothesis of no systematic differences between the coefficient of the PMG and MG. It checked a more efficient model against a less efficient but consistent model in order to ensure that the efficient model gives consistent results.

The result showed that the Hausman test fails to reject the long run homogeneity restriction, at the conventional levels of significance, supporting the appropriateness of the PMG estimates in all cases. The Prob > chi2 is equal to 0.9451 which is greater than 0.10 level of significance. The P-value happens to be significant and thus the PMG is recommended. Since the Hausman tests

**Table 3. Budget deficit and economic growth (Dependent variable: Economic growth)**

	PMG		MG	
Linear prediction				
BD	-0.027***	(-5.224)	-0.021	(-0.369)
SR				
Linear prediction	0.023***	(3.859)	0.009	(0.712)
D.BD	0.001	(1.633)	0.001	(1.378)
Constant	-0.210***	(-3.571)	-0.075	(-0.563)
R <sup>2</sup>				
F				
Observations	540		540	

t statistics in parentheses  
 \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01  
 Source: Author's computation using Stata14.  
 Hausman test results: Prob > chi2 = 0.9451



confirm the PMG estimates, that is, the panel is heterogenous in the short run and homogenous in the long run, emphasis will be based on the PMG estimators for interpreting the results.

**Long run:** The result in Table 3 shows that budget deficit as a percentage of GDP has a negative effect on economic growth in SSA countries. This is shown by the coefficient of BD (-0.027). That is, a one per cent increase in budget deficit will lead to a decrease in gross domestic product by 0.027 per cent. The Prob>z shows that at ten per cent (10%) significant level, the probability level is 0.000 which is less than 0.10. From the results therefore, the null hypothesis is rejected and the conclusion is that budget deficit has a negative significant effect on economic growth in SSA countries. The Z statistic shows that there is a total deviation of -5.224.

**Short run:** The short run result in Table 3 shows that budget deficit as a percentage of GDP has a positive effect on economic growth in SSA countries. This is shown by the coefficient of BD (0.001). That is, a one per cent increase in budget deficit will lead to an increase in economic growth by 0.001 per cent. The Prob>z shows that at ten per cent (10%) significant level, the probability level is 0.103. From the results therefore, the null hypothesis is rejected and the conclusion is that budget deficit has a positive significant effect on economic growth in SSA countries. The z-statistic therefore shows that there is a total deviation of 1.633.

## 5. SUMMARY, CONCLUSION AND POLICY IMPLICATION

This study empirically examined the long run and short run effect of budget deficit on economic growth in SSA Countries from 1991 to 2018. Twenty SSA countries were chosen based on their income group. The study employed the PMG and MG analysis and went further to apply the Hausman test to determine the appropriate estimation technique to apply in the study. The result of the Hausman test indicated that the PMG estimation method was appropriate. Based on the estimation result, it was found that in the long run, budget deficit has a negative and significant effect on economic growth, while it had a positive and significant effect in the short run in SSA countries. The result of the findings therefore supports the Keynesian theory in the short run that budget deficit has a positive effect on economic growth while it supports the Neoclassical theory in the long run.

We therefore conclude that government should ensure judicious use of borrowed fund and invest such funds on capital projects that can generate good return in the future. Furthermore, Government should reduce the overall recurrent expenditure as it will help to mitigate the problem of budget deficit that leads to debt accumulation in SSA countries and increase expenditure on developmental projects.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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