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## Article

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Article

# Dynamic Relations Between Public External Debt and Economic Growth in African Countries: A Curse or Blessing?

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**Abstract:** This paper used the Johansen Cointegration test and system Generalised Method of Moments (sysGMM) to examine the dynamic relations between external debt and economic growth in 43 African countries over the period 2001–2018. The study used data from World Development Indicators (WDI) as published by the World Bank and the World Economic Outlook database as provided by the International Monetary Finance (IMF). The study provides an understanding of how the importance of external debt could be short-lived due to its misapplication. The result reveals evidence to support a long-run equilibrium relationship between external debt and economic growth in Africa. The result demonstrates that beyond a specific capacity, the short-run converges to equilibrium in the long-run and external debt would start to have a deteriorating impact on economic growth in Africa. The findings of this study reinforce the need for policymakers to ensure proper application of external debt on economic activities that would lead to sustained long-term economic performance. Moreover, the government and development partners must put in place a monitoring mechanism to ensure the efficient use of borrowed funds.

**Keywords:** external debt; government investment; economic growth; policy; Africa

**JEL Classification:** E31; F33; F35; H63

## 1. Introduction

Over the past few years, high levels of external debt have turned into an inviting target for criticism among policymakers, professionals and other agents of economic development. The seriousness of this issue, especially in Africa, is exacerbated by the recent global financial crisis and the quest by various governments around the world to revamp their economy with borrowed funds [1,2]. For several reasons, developing countries tend to rely on borrowed funds, foreign equity portfolio investment (FEPI) and foreign direct investment (FDI) flows to harness and grow the economy [3,4]. Moreover, given the low level of domestic economic activities to guarantee quality internally generated funds, the use of external debt by developing countries to address the challenges of economic growth and development has become an issue of a necessity that is difficult to avoid rather than a choice. However, there are concerns from different quarters about the mixed Gross Domestic Product (GDP) growth dynamics and the further impact the recent surge in external debt would have on the economy as well as on the living standard of the citizens [5]. This concern is mostly because of the observed

gross misapplication and deliberate channelling of public funds into private use, which in no small measure could escalate the burden of debt servicing as well as deprive the host country of investment in infrastructure and the burden of debt servicing.

In Africa, the level of inefficiencies and the mismanagement of public funds through corrupt practices along the public investment processes has remained unabated with consequences for economic growth. In the opinion of Al-Tamimi and Jaradat [6]; Chimezie, Omankhanlen and Eriabie [7]; Senadza, Fiagbe and Quartey [8] and Udeh, Ugwu and Onwuka [9], external debts could be harmful to economic growth, particularly when there are adverse terms of trade, weak institutional and poor governance structures that encourage the mismanagement of resources. Conversely, external debt could be useful to stimulate economic growth, especially when carefully administered and managed along the corridors of critical economic activities. In recent studies, Ijirsha, Joseph and Godoo, [10], Matuka and Asafor, [11] and Ndubuisi, [12] opined that appropriately managed external debt could support favourable growth, particularly in developing economies where there are abundant opportunities to invest such funds in profitable projects. However, against this background, the relationship between external debt and economic growth in developing economies is one aspect of the literature that is still poorly understood due to conflicting reports. Moreover, a significant challenge in the debt and growth connection for the African economies is the inability to define the optimum external debt threshold that is good for the economy [13].

With the level of economic activities and the problem of debt, several stakeholders of the African economy are worried whether the present level of external debt is a curse or blessing to African countries. What is the nature of the relationship between external debt and economic growth in Africa? To what extent is external debt useful to stimulate economic performance? These are important policy questions with implications that need proper evaluation for decision making. Moreover, following Megersa's [1] submission that further studies are required to understand the debt–growth link, this study seeks to empirically investigate the nature of the relationship between external debt and economic growth in Africa. In other words, this study examines in the phase of the present economic activities, whether the external debt is a blessing or a curse to African countries. Theoretically, the neoclassical growth model explains the direct influence of debt on economic growth, based on how borrowed funds may serve to increase investment [14,15]. In the transmission mechanism, public external debt could hurt economic growth because of the reduced resources available for investment due to debt servicing and the high cost of capital because of higher interest rates, which may lead to lower investment at the private sector [16,17]. On the other hand, public debt acquired to implement expansionary fiscal policies of the government with mechanisms in place to avoid any potential economic recession may lead to positive economic growth [18].

Furthermore, several studies have documented the connection between external debt and economic growth [19,20]. However, the result of these studies from different backgrounds and using a range of models, samples period for analysis and control variables vary considerably [21–24]. In addition, most of the studies on this issue such as Elbadawi, Ndulu, and Ndungu [25], Butt [26], Pattillo et al., [13] and Senadza et al., [8] focused on combining datasets from Sub-Saharan African (SSA) countries with other regions such as the Middle East, Latin America and the Caribbean. These studies have failed to evaluate the possible cointegration between external debt and economic growth or to assess the influence of external debt on economic growth using data from Africa countries only.

Following the objective of this study to examine the relationship between public external debt and economic growth in developing countries, the immediate issue investigated in this study is whether economic growth cointegrates with public external debt and other variables named in the study using the Johansen cointegration test for the sample period 2001 to 2018. Moreover, using the system Generalised Method of Moments (SysGMM) and the dynamic panel data obtained from 43 African countries over the period 2001 to 2018, the study seeks to estimate the impact of public external debt on economic growth. Compared with other models such as the Ordinary Least Square (OLS), the sysGMM allows for the control of potential endogeneity between explanatory variables. This

study hypothesised a negative relationship between public external debt and economic growth in developing countries. Given the desire by the African governments to ensure poverty alleviation and employment creation among other essential needs, the investigation of the connection between public external debt and economic growth in Africa has some policy implications for its policymakers. Also, this issue is essential for evaluation, considering the impact of the rising debt profile of African countries [27]. The obligation for the borrowing country to repay the borrowed funds underpins the need for policymakers to understand the need to ensure the judicious use and management of external debts in profitable projects that would guarantee its repayment.

Furthermore, it is also essential for practitioners and other stakeholders of the economy to understand how external debts impact on economic growth. The result of the study demonstrates a cointegrating relationship between the variables under consideration. The analysis of this study indicates that there is a negative and nonlinear relationship between public external debt and economic growth in Africa. More also, the result demonstrates that human capital development and investment have a positive impact on growth. This study will benefit policymakers in formulating policies that would ensure the optimum deployment of external debt to drive economic growth and development.

The remaining part of this paper is structured as follows: In Section 2, the theoretical and empirical literature on this issue is discussed. In Section 3, the study presents data and econometric methods used in the analysis. In Section 4, the study shows the empirical results and discusses the policy implications of the findings, while Section 5 concludes with recommendations and directions for future research work.

## 2. Literature Review

Recently, there have been repeated arguments by the policymakers and other stakeholders of the economy about the implication of high levels of external debt on economic growth, given the level of misappropriation of public debts and the rate of unemployment and poverty in the continent of Africa. Public external debt is the total amount of funds borrowed from foreign sources or owed to external creditors [7,15,28,29]. To some extent, the government needs some amount of external finance to stimulate economic growth through investment in both human resources and other profitable ventures. As a matter of policy thrust, the government may sometimes have a budgetary allocation that is above the expected revenue, which therefore can lead to having deficits that would necessitate the need for the government to use borrowed funds as a bridge to the shortfall from domestic capacity. In this case, the government will usually use external debt because of the convenience and the extended repayment period. However, in the case of African countries, the use of foreign debts to address budget deficits may be a matter of necessity due to weak domestic savings capacity and the slow economic growth rate. This situation could be worse when such borrowed funds are misappropriated [30].

Several studies explain the debt and economic growth relationship [1,2,13]. The neoclassical growth theory posits that there is a direct relationship between the debt of a country and its economic performance. The theory argued that where there is stability in macroeconomic variables and policies that encourages investment, borrowed funds used in profitable investments are expected to have a favourable impact on economic output that would allow for the quick servicing of debt [15]. However, where there is sub-optimum use of debt, the resources available for productive investment would decrease due to the burden of debt servicing. Another important theory that explains the debt–growth relationship is the debt–cum–growth theory, which argued the superiority of external borrowing as a substitute for domestic savings for a country to finance productive investment. However, the challenge with this theory is the situation whereby domestic savings and investment may be crowded out from the business cycle [15,31]. The debt–cum–growth theory submits that the size of a country’s debt should be reasoned in terms of the cost and benefit of borrowing to economic growth. The theory posits that the capacity of a country to take on additional debt service obligations should be considered along with the contribution such borrowing would have on economic performance [28].

The observed evidence about the impact of external debt on growth is diverse. Prior studies have shown that the level of economic growth of a country may explain the amount of external funds received by the economy [1,11,12]. The study of Geiger [32] employed a dataset from South American countries to examine the influence of external debt on economic performance in Latin American countries from 1974 to 1986. The study, which used the lag distributed model, found evidence to show that foreign debt has a statistically significant inverse connection with economic output. In a related study, Cohen [33] appraised the effect of debt on the economy and argued that when external debts are utilised correctly in investment with excellent or adequate returns to service the obligations, external debt will not constitute a burden to the borrower or a threat to the survival of the domestic economy. He, however, alluded to the fact that where there is a suboptimal use of debt and without adequate returns to service the debt, then external debt that ought to be good can remain a burden for the domestic economy to service. In another development, Warner [34] examined the connection between external debt and investment in a period of crisis. Still, he found no evidence to establish a negative influence of external debt on economic growth.

In another study, Chowdhury [35] investigate the causality between external debt accumulation rate and the GDP growth rate in ten Asian pacific nations, using the three-stage least squares (3SLS) to analyse the yearly data from the period 1970 to 1988. In the study, Chowdhury argued that the negative causal relationship that exists between the external debt accumulation and GDP growth rate was responsible for an economic recession. Following the findings from the structural analysis, the study established that public sectors' external borrowing positively impact on the GDP. Elbadawi, Ndulu and Ndungu [25] used data from 99 developing countries in Asia, sub-Saharan Africa, the Middle East and Latin America to examine the impact of debt overhang on economic growth. They concluded that external debt has a negative relationship with economic growth due to accumulated debt beyond a certain level, resulting in debt overhang and outflows to service obligations. In a related study, Pattillo et al. [13] employed a dataset from 93 developing countries in Latin America, Sub-Saharan Africa and the Middle-East to investigate the connection between debt and growth from 1969–1998. The study employed OLS, instrumental variables, fixed effects and system Generalised Method of Moments (GMM) as methodologies to show the connection between the variables. The empirical studies concluded that there is a positive impact of an optimal debt level on growth. The study, however, went further to show that beyond the appropriate debt levels, further borrowing can negatively impact growth.

The study of Clements, Bhattacharya and Nguyen [36] assessed the connection between external debt, public investment and growth in low-income countries. They found a marginal negative relationship between 50 per cent of the nominal debt to GDP ratio and growth and a 20–25 per cent NPV of debt-to-GDP ratio and growth for highly indebted developing nations. But Schclarek [37] employed data from 59 developing and 24 developed countries to investigate the connection between debt and economic growth from 1970 and 2002. The study reported that there is no indication of a link between foreign debt and total factor productivity. However, while the study reported an adverse connection between public debt and economic output in developing nations, the analysis with developed countries shows that there is no evidence to affirm a relationship between public debt and economic performance. In a related study, Jayaraman and Lau [17] employed data from six nations from the pacific island for 1988–2004 to assess the impact of foreign debt on economic performance. In that study, they established that there is evidence for cointegration, as well as a positive and statistically significant link between external indebtedness and economic growth.

Further, using the Granger Causality method to analyse data from 27 countries from the Caribbean and Latin American regions for the period 1970 to 2003, Butt [26] evaluated the impact of external debt on growth. The study recorded evidence of a causal relationship between the variables in 13 countries. Using the dynamic board information model to analyse the dataset from 19 nations for the period 1990 to 2011, Zouhaier and Fatma [38] assessed the impact of financial obligation on financial development. The study found that the ratio of outside obligations to GDP negatively influenced monetary growth.

The work of Halima [39] used the fixed and arbitrary impact models and data from Kenya, Rwanda, Tanzania and Uganda to examine the impact of outer open obligations on monetary development for the period 1981 to 2014. In that study, Halima reported that external obligations adversely impacted the financial growth of the countries under consideration. Halima argued further that local obligations and macroeconomic variables such as the expansion rate and conversion scale amongst others were not crucial for financial development. Still, capital stock significantly impacted on monetary development.

Senadza et al. [8] used a dataset from 39 Sub-Saharan African (SSA) countries and the framework summed up techniques for a minute estimation strategy to investigate the connection between outside obligations and financial development during the period 1990 to 2013. They recorded a negative relationship between outside obligations and monetary development of the 39 SSA countries. Following the mixed evidence in the literature, Mensah et al. [23] attempted to explain the collective impact of institutional quality and external debt on the economic growth of 36 Sub-Saharan African countries from 1996–2013. The study used the system GMM and found that external debt explains the patterns of economic growth in SSA. The study submitted that external debt invested correctly in profitable projects would have a positive effect on growth. However, beyond certain levels, external debt may not be relevant and has a negative influence on economic growth in SSA.

### 3. Data and Methodology

This study employed data sourced from the World Development Indicators (WDI) as issued by the World Bank and the World Economic Outlook database, as provided by the International Monetary Fund (IMF). The study employed balanced data from 43 African countries for the period 2001–2018 with 216 monthly time series observations. The list of the countries in the sample study are in Table A1 in Appendix A. In keeping with the literature, the data for this study covers the main variables of interest, which are the per capita GDP growth and total public external debt to GDP ratio [23,24,29,40]. Moreover, we added control variables to explain other factors that may have some influence on economic growth in Africa. This study focused on the relationship between external debts by the public sector and economic growth in selected African countries.

Reinhart and Rogoff [21] provided evidence of an inverted “U” relationship between growth and public debt. Also, Pattillo et al., [13] opined that the impact of debt on economic growth may be positive at the beginning of the acquisition debt but may soon become negative when there is an accumulation of debt, leading it to a nonlinear relationship. However, DiPeitro and Anoruo [3] opined that economies had since crossed the optimal level, which makes it possible for a linear relationship between the variables under consideration. Consequently, this study developed linear and nonlinear models to analyse the relationship between public external debt and economic growth in Africa. This study employs time series data that are known to trend, which means the data have a nonlinear relationship and are likely to be highly skewed. Thus, we transformed the dataset for this study into their natural logarithm to improve the data quality and deal with any potential issue with the variation of the data from their normal distribution. This study hypothesised a negative correlation between public external debt and economic growth in Africa. The model used in the analysis is specified as follows:

$$\log RGDP_{it} = \beta_0 + \beta_1 \log RGDP_{(t-1)} + \beta_2 \log EXDEBT_{it} + \beta_3 \log X_{it} + \eta_i + \lambda_t + \varepsilon_{it} \tag{1}$$

$$\begin{aligned} \log RGDP_{it} &= \omega_0 + \omega_1 \log RGDP_{(t-1)} + \omega_2 \log EXDEBT_{it} \\ &+ \omega_3 \log(EXDEBT)_{it}^2 + \omega_4 \log X_{it} + \eta_i + \lambda_t + \varepsilon_{it} \end{aligned} \tag{2}$$

where log is the logarithm of the variables, *RGDP* is the log difference in the real GDP growth and *it* denotes country *i* in time *t* for the sample period of the study. *RGDP*<sub>*t*-1</sub> is one year lagged real GDP and *EXDEBT* indicates public external debt measured as public external debt to real GDP. *EXDEBT*<sup>2</sup> represents public external debt in squared term to real GDP, and it is added to the model to test if there is a nonlinear relationship between public external debt and economic growth. While *X* indicates the

measure of the standard control variables, the country specific effect is denoted as  $\eta$ , the time-effect is represented as  $\lambda$  and  $\varepsilon_{it}$  is the stochastic or random error term. The control variables include trade openness (TO), which is the logarithm of the three-year-average and it is measured as the ratio of import plus exports to real GDP. Interest rate (INTR) is measured as prime lending rate, inflation rate (INFL) is measured by the consumer price index, government investment (GINV) is measured as a proportion of government expenditure to real GDP, the population growth rate (POPG) and human capital development (HCD) are measured as annual expenditure on education to real GDP. Meanwhile, the study analysed the variables in a natural logarithm form.

This study adopts the system Generalised Method of Moments (SysGMM) technique as developed by Blundell and Bond [41] to estimate the dynamic panel data from the 43 African countries. The system GMM model is essential to deal with the weakness related to the use of difference GMM estimator developed by Arellano and Bond [42]. According to Aghion, Bacchetta, Rancière and Rogoff [43], the system GMM can take account of the time dimension in the dataset. Unlike the Ordinary Least Square (OLS), the system GMM considers all variables as being endogenous, which allows the control for potential autocorrelation and endogeneity between the explanatory variables. The study employs the Generalized Least Square (GLS) model to assess the validity and robustness of the results obtained using the system GMM. Since the data for this study are time series in nature, there are various tests to check the stationarity of the data. To test if the data have unit root or not and the order of integration that is, order 1(0) or 1(1), the study employed the Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) tests. For the purpose of this study, the optimum lag length was selected by means of the Akaike Information Criterion (AIC). The study assumed that the data have unit roots, which suggests that the data are non-stationary. The ADF and PP unit root tests equation were specified as follows:

$$\Delta\lambda_t = \delta\lambda_{t-1} + \sum_{i=1}^p \beta_i \Delta X_{t-i} + \varepsilon_t \tag{3}$$

$$\Delta\lambda_t = \pi\lambda_{t-1} + \beta_i D_{t-1} + \varepsilon_t \tag{4}$$

where  $\Delta$  means the first difference,  $P$  represents the lag operator,  $t$  signifies the time subscript and  $\varepsilon$  is the stochastic variable or the error term. The  $D_{t-1}$  is a deterministic trend component. The point of decision was measured where the test statistics is  $>$  or  $<$  the ADF critical value. Further, once the data were confirmed to be integrated to order I(1), the study proceeded to test if there is a cointegration between public external debt and economic growth using the Johansen Cointegration test. Distinct from the Engle and Granger [44] technique used to establishing the connection between one time series and another, the Johansen cointegrating technique was valuable for this study because of the model’s ability to explore co-movements and determine the relationships between several non-stationary time series data in a study. In other words, the Johansen cointegration technique is essential in this study to resolve problems associated with the Engle and Granger technique. The Johansen [45] technique which uses a system of equations to determine the long-run equilibrium relationship, provides information about the Trace Value test statistics and maximum Eigenvalue to establish the number of cointegrating vectors. This study postulated in a null form that there is no long-run equilibrium relationship between the variables. The cointegration test of this study follows the process of a restricted vector autoregressive (VAR) model that is defined in error correction form. The study expressed the error correction model developed by Johansen [29] as:

$$\Delta\Pi_t = \Omega + \sum_{j=1}^{k-1} \mu_j \Delta\Pi_{t-j} + \Theta\Pi_{t-k} + \varepsilon_t \tag{5}$$

where  $\Delta$  denotes the first difference notation,  $\Pi_t$  is the  $p \times 1$  which is the vector of the  $n$  variables and  $\Omega$  represents the  $p \times 1$ , which is the constant vector representing a direct movement in a system and  $k =$  Lag structure. The Gaussian white noise residual vector is represented by the  $\varepsilon_t$ . Also,  $\mu_j$  is a

$p \times (k - 1)$  matrix that shows short-term changes between variables across  $p$  equations at the  $j^{\text{th}}$  lag and  $\Pi$  is a  $(p \times p)$  coefficient matrix, which is the cointegrating vectors. To assess the reduced rank of the matrix  $\Pi$ , the vector error correction model of Johansen (1991) employs the trace statistics, which is  $\lambda_{Trace} = -T \sum_{i=r+1}^p \ln(1 - \lambda'_i)$ , and the Maximum Eigenvalue method, which is  $\lambda_{max} = -T \ln(1 - \lambda'_{r+t})$ .

In this model,  $T$  represents the number of observations in the sample study,  $r$  is the number of individual series and  $\lambda$  is the Eigenvalues. The decision point is for the study to reject the null hypothesis if the Trace or Max-Eigen statistic is greater than the 0.05 critical value or reject the null hypothesis if the probability value is less than or equal to 0.05. If the time series have a long-run relationship, which means that they are cointegrated, it therefore suggests that the time series are related and that even if there is any shock in the short-run, they still converge with time in the long run. The presence of cointegration would confirm the existence of a long-run equilibrium relationship between public external debt and economic growth in selected African countries.

#### 4. Empirical Results and Discussion

##### 4.1. Descriptive Statistics

Table 1 presents the results of the descriptive summary statistical analysis of the variables in the study. The result shows that between 2001 and 2018, the real GDP growth for Africa countries ranges from 45.83 to 5483.14 with an average value of 1014.36 and a standard deviation of 632.42. Going by the World Bank standard, the countries in the sample live within the low-and-middle-income bracket, an indication for low economic growth and development. The result reveals that the total public external debt to real GDP ratio is an average of 52.08 per cent with a standard deviation of 38.44 per cent. With the level of external debt as revealed in Table 1, private investment and domestic savings can be a challenge because of the marginal taxes and high rate of inflation induced by the burden to service debt. Table 1 shows that government investment, human capital development and interest rates recorded an average value of 3.102, 3.62 and 21.03, respectively.

**Table 1.** Descriptive statistics of the variables.

Variable	Obs.	Mean	Std. Dev.	Min	Max
RGDP	334	1014.36	632.42	45.83	5483.14
RGDP <sub>t-1</sub>	334	905.75	2057.01	91.22	7013.30
Inflation rate	334	33.14	13.01	5.03	56.86
External debt	334	52.08	38.44	5.92	193.71
Government Investment	334	3.102	1.274	0	61.47
Trade Openness	334	2.38	3.01	0	46.36
Interest rates	334	21.03	09.37	11.56	29.33
Population Growth	334	3.01	1.29	1.07	7.13
Human Capital Development	334	3.62	4.05	0	43.01

Source: Authors' computation, 2020.

##### 4.2. Correlation Matrix of the Variables

As expected, the results of the correlation matrix of the variables in the study presented in Table 2, reveals a negative correlation between external debt and economic growth with a correlation coefficient of  $-0.371$  s. The result indicates that an increase in the level of external debt will lead to a decrease in economic growth. This result is partly because of the mismanagement of external debt in the region. It also suggests that the weak economic growth may be because the available earnings from investment



and taxes meant for development are now being used for servicing interest and other obligations arising from the debt. As a contrast, it also implies that when debt is appropriately applied and the economy is performing well, the funds generated would be enough to service the external debt to a point where there will be no negative impact on the economy. The result shows that public external debt has a significant positive correlation with inflation and interest rate with a correction coefficient of  $-0.281$  and  $-0.040$ , respectively. Surprisingly, population growth has a significant negative correlation with economic growth, which suggests that a large proportion of Africa’s population is not involved in productive economic activities.

**Table 2.** Correlation matrix of the variables in the sample.

Variables	RGDP	RGDP <sub>t-1</sub>	INFL	EXDEBT	GINV	TO	INTR	POPG	HCD
RGDP	1.000								
RGDP <sub>t-1</sub>	0.503	1.000							
INFL	-0.227	-0.131	1.000						
EXDEBT	-0.211	-0.130	-0.516	1.000					
GINV	0.253	0.116	-0.140	-0.352	1.000				
TO	0.115	0.204	-0.118	-0.177	0.302	1.000			
INTR	-0.171	-0.060	0.503	0.316	-0.030	-0.117	1.000		
POPG	-0.011	0.026	0.053	0.057	0.064	0.090	0.410	1.000	
HCD	0.309	0.266	0.210	0.211	0.333	0.114	0.137	0.042	0.101

Source: Authors’ computation, 2020.

The correlation between economic growth and investment, human capital development and trade openness is also positive, which means that Africa has an excellent chance to use investment and trade to develop the economy, especially when adequately harnessed. As presented in Table 2, the value of the explanatory variables appears not to be high, which shows that there is no problem of multicollinearity in the sample. Moreover, the Variance Inflation Factor (VIF) presented in Table 3 confirms the evidence in Table 2 about multicollinearity. The result of the VIF analysis shows a maximum and mean value of 1.43 and 1.2643, respectively, which is lower than the value of 10 usually used as a rule of thumb to establish the issue of multicollinearity with explanatory variables in multivariate analysis. The result of VIF suggests that there is no serious issue of multicollinearity with the data employed.

**Table 3.** Results of the Variance Inflation Factor.

Variables	VIF	1/VIF
RGDP <sub>t-1</sub>	1.04	0.96
INFL	1.21	0.83
EXDEBT	1.26	0.79
GINV	1.16	0.86
TO	1.30	0.76
INTR	1.14	0.88
POPG	1.06	0.94
HCD	1.01	0.99
<b>Mean VIF</b>	<b>1.1475</b>	

Source: Authors’ computation, 2020.

### 4.3. Properties of the Data

The study used time series data for the analysis and assumed the presence of unit-roots. Therefore, to check if the data have unit roots or not, the study employed the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. For this study, the null hypothesis is that there is the presence of a unit root, which suggests that the data are non-stationary. The approach is that where the data are non-stationary at levels, the next step is to the first difference. The result in Table 4 reveals that at

the first difference, the real GDP (lnRGDP), inflation (lnINFL), trade openness (lnTO), external debt (lnEXDEBT), government investment (lnGINV), human capital development (lnHCD), interest rate (lnINTR) and population growth (lnPOPG) all have a probability values over the 5% level of significance. This result demonstrates that the variables are all stationary at their first difference. This result implies that the sequence is integrated of the same order one that is, 1(1) at the first differences. Since the series are considered to be stationary, we rejected the null hypothesis of non-stationarity and proceeded to test for cointegration between public external debt and economic growth in Africa.

**Table 4.** Results of unit root analysis.

Variables	ADF				PP			
	Level		First Difference		First Difference			
	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend
lnRGDP	-1.019	-1.406	-6.011	-7.326	-1.736	-1.811	-7.422	-5.083
lnINFL	-1.173	-1.543	-5.403 *	-5.279 *	-1.044	-3.604	-5.003 **	-7.846 **
lnEXDEBT	-0.208	-1.850	-4.410 **	-7.114 **	-1.328	-3.857	-5.044 **	-9.736 **
lnGINV	-1.853	-2.741	-5.333 **	-5.603 **	-1.118	-1.380	-3.125 **	-6.318 **
lnTO	-1.375	-1.918	-3.572	-1.441	-0.633	-1.311	-3.047	-3.046
lnINTR	-0.162	-2.822	-5.293 **	-3.300 **	-1.401	-4.333	-3.141 *	-5.382 *
lnPOPG	-1.513	-2.205	-3.452	-3.726	-1.094	-5.592	-15.095	-15.735
lnHCD	-1.311	-1.333	-6.300 **	-3.904 **	-1.645	-5.033	-5.064 **	-5.393 **

Source: Authors' computation, 2020. Note that \*\* and \* are significant at 5% and 10%, respectively.

Following the integration order, which is order one at first differences, the study proceeded to establish the long-run equilibrium relationship between the variables using the Johansen 1991 Cointegration test. The study used the Trace and Max-Eigenvalue statistics for the number of cointegrating vectors. We performed the cointegration test on the level form using the log transformation of the variables. The result in Table 5 shows that the trace statistics have five cointegrating vectors at the 5% critical level. The result of the maximal eigenvalue statistics indicates six cointegrating equations at the 5% level of significance. This result implies the rejection of the null hypothesis that there is no cointegration. This result, therefore, established the presence of a long-run equilibrium relationship between economic growth and the explanatory variables in Africa. This result is consistent with the study by Matthew and Mordecai [15].

**Table 5.** Results of the cointegration test.

Hypothesised	No. of CE(s)	Trace			Max-Eigen			
		Statistic	5% CV	1% CV	Prob.**	Statistic	5% CV	1% CV
None **	192.0622	135.362	1468.036	0.0000	75.0356	57.142	64.016	0.0000
At most 1	142.1183	124.635	124.843	0.0036	56.001 **	53.904	58.111	0.0301
At most 2	115.802 **	96.031	86.006	0.0267	47.052 *	44.0138	52.316	0.0033
At most 3	94.4542 **	62.027	58.111	0.0302	41.116 **	33.652	46.154	0.0283
At most 4	60.0019	32.411	46.045	0.1000	35.054	25.1460	40.347	0.0853
At most 5	37.0352 **	26.031	40.831	0.0341	28.636 **	14.108	33.001	0.0370
At most 6	16.0377 *	22.046	34.002	0.0099	22.010 *	9.3628	28.035	0.0011
At most 7	3.3207	12.225	16.024	0.0026	3.3207	12.225	16.024	0.0032

Source: Authors' computation, 2020. CV denotes the critical value. Note that \*\* and \* denotes rejection of the hypothesis at the 5% and 10%, levels, respectively.

#### 4.4. Regression Analysis

To examine the relationship between public external debt and economic growth in 43 African countries, the study proceeded with a linear specification. After that, the study turned to examine the nonlinear connection between the variables using the system GMM. The final analysis before the diagnostic test was the robustness check using the GLS to confirm the validity of the results obtained with system GMM. The focus was to establish whether there is a nonlinear association between the variables. This approach is contrary to that of Pattillo et al. [13], who examined the thresholds at which there is a negative connection between external debt and economic growth. Table 6 presents the results from the regression analysis from the linear and nonlinear specifications.

**Table 6.** Results of the System GMM estimation.

Variables	Model 1 Linear		Model 2 Squared		Model 3 Combined	
	Coefficient	Standard error	Coefficient	Standard Error	Coefficient	Standard Error
logRGDPPC <sub>t-1</sub>	-0.0103 ***	0.0029	-0.0311 ***	0.0021	-0.0110 ***	0.0021
logINFLATION	-0.0816 ***	0.0512	-0.0306 ***	0.0244	0.0610 ***	0.0111
logEXTD_GDP	-0.0530 ***	0.0364			0.0271 ***	0.0146
Log(EXTD_GDP) <sup>2</sup>			-0.0861 **	0.0021	-0.0409 ***	0.0220
logINVESTMENT	0.0420 **	0.0029	0.1080 ***	0.0435	0.0417 ***	0.0311
logTRADE OPEN	0.1144 ***	0.0418	0.0308 ***	0.0184	0.0348 ***	0.0104
logINTR	-0.0108 ***	0.0016	-0.0913 ***	0.0204	0.0293 ***	0.0194
logPOPGROWTH	-0.0429	0.0052	-0.0029	0.0041	-0.0188 **	0.0140
logHCD	0.0380 ***	0.0563	0.1831 ***	0.0735	0.0913 ***	0.0400
Constant	2.0318 ***	0.2082	2.0312 ***	0.0432	1.0223 ***	0.0026
Observations	216		216		216	
Number of countries	43		43		43	
R <sup>2</sup>	0.347		0.285		0.329	
Hansen OIR test (p-value)	0.3011		0.6103		0.2631	
AR(1) p-value	0.2736		0.5009		0.2539	
AR(2) p-value	0.1109		0.2647		0.4924	

Source: Authors' computation, 2020. Note that \*\*\* and \*\* shows significance at 1% and 5% levels, respectively.

Furthermore, column 1 of Table 6 represents the result of the estimates using the full sample of the study. The objective then was to establish a linear relationship between external debt and economic performance. The finding of the analysis reveals that there is a positive linear relationship between public external debt and growth. Furthermore, the positive linear correlation between public external debt and economic growth is in line with the literature [17,23,31]. This result demonstrates that external debt that is properly managed and invested in profitable projects will continue to have a positive influence on economic growth in developing countries. This finding implies that until a time when there is a misapplication of external debt or when external debt is over-accumulated, the economic output is expected to be enhanced. However, as reported in columns 2 and 3 of Table 6, the coefficient of the external debt squared term (EXTD\_GDP<sup>2</sup>) is statistically significant and negative at the 5% level of significance. Specifically, the result indicates a negative nonlinear relationship between public external debt and economic growth in developing countries in Africa. This result points to the fact that there is evidence of an inverted “U” shape, which confirms the presence of the debt Laffer curve in the relationship between external debt and economic growth in Africa.

Moreover, the result in columns 2 of Table 6 demonstrates that a growth in external debt squared will cause approximately a 0.0861% fall in real GDP. The negative influence of public external debt on economic growth is in line with the neoclassical growth models [14,15]. This result confirms the claim in the literature of an inverted “U” shape between external debt and economic growth.

The result validates the findings of Pattillo et al. [13], DiPeitro and Anoruo [3], Doğan and Bilgili [5] and Megersa [1]. This result implies that beyond a certain point, external debt accumulation may not be relevant, since it would have an adverse nonlinear impact on growth. Following this result, policymakers need to note that further upward surge in public external debt stocks may limit the ability of African countries from accessing externally borrowed funds in relaxed conditions, which may further reduce the rates of economic growth.

The adverse impact of population growth on economic growth suggests that unproductive population growth will continue to have a negative influence on economic growth and the living standard of Africans until when there is an improvement in the variable. This result is contrary to Agbloyor, Gyeke-Dako, Kuipo and Abor [46] and Doğan and Bilgili [5]. They argued in their studies that a large population could enhance economic growth because it provides cheap labour as well as creates markets for the goods and services. From a practical perspective, population growth without adequate and appropriate human capital development that would enable such a population to be productive may turn out to be a burden on economic growth. The analysis shows that investment, human capital development and trade openness have a positive impact on economic growth. The positive relationship between investment and growth is consistent with the studies carried out by Megersa [1]; Mensah et al., [34] and Areghan, Felicia, Arogundade, Godswill and Chisom [47]. The important implication of this result for policymakers is the weight and direction of the connection between economic growth and other variables, which is defined by the signs of the coefficient values. Consistent with the expectation of this study, the result suggests that investment, trade openness and education will continue to have a positive impact on economic growth in Africa. Consequently, an effort is required by the government to improve the level of investment and deepen the development in the areas of education and trade openness for economic growth.

The analysis suggests that inflation and interest rates both have a negative relationship with economic output. Another important consideration for the policymakers is that any increase in the level of uncertainty may lead to higher inflation and interest rates that would, in turn, affect economic growth [16]. The negative influence of these variables on economic growth indicates that deliberate efforts by the government are required to improve on the performance of macroeconomic variables to enhance economic growth, *ceteris paribus*. Besides, the need for the government to improve the business environment with policies and program is essential for economic performance.

#### 4.5. Robustness Check

This study took steps for the robustness checks of the results obtained with the system GMM. First, the study employed the Generalized Least Square (GLS) method to estimate the connection between public external debt and economic performance in selected African countries. Second, taking into consideration the government policy to provide primary education instead of using expenditure on inclusive education, the study measured human capital development as annual expenditure on primary education to real GDP. Third, to observe if the transmission channel would further undermine economic growth, instead of using the prime lending rate, the study measured interest rates using treasury bills. Fourth, the study used an average of a three year sample period to check for the business cycle effects. The results remain unaffected, as presented in Table 7. The coefficient of public external debt and debt squared remains statistically significant with a similar sign, confirming the pattern of results with system GMM. The result shows that external debt has a significant and positive influence on economic growth, and it is significant at the 5% level. The result is in agreement with the result obtained in Table 6 using the system GMM and where the real GDP denotes the dependent variable.

**Table 7.** Results of the robust check—GLS.

Variables	Model 1 Linear		Model 2 Squared		Model 3 Combined	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
logRGDPPC <sub>t-1</sub>	0.0483 ***	0.0211	0.0401 ***	0.0294	-0.0135 ***	0.0222
logINFLATION	-0.0347 **	0.0203	-0.0511 ***	0.0416	-0.0616 ***	0.0412
logEXTD_GDP	-0.0811 **	0.0529			0.0335**	0.0227
Log(EXTD_GDP) <sup>2</sup>			-0.0902 ***	0.0530	-0.0705 **	0.0108
logINVESTMENT	-0.0438 ***	0.0203	0.0463 ***	0.0207	0.0463 ***	0.0222
logTRADE_OPEN	0.0411 **	0.0309	0.0503 ***	0.0379	0.0707 ***	0.0411
logINTR	-0.0616 ***	0.0311	-0.0806 ***	0.0486	-0.0366 ***	0.0370
logPOPGROWTH	0.0113 ***	0.0163	0.0213 ***	0.0106	0.0206 ***	0.0106
logHCD	0.0623	0.0452	0.0811	0.0428	0.0811 **	0.0204
Constant	-0.1308 ***	0.0563	-0.1174 ***	0.0563	-0.0673 ***	0.0292
Observations	216		216		216	
Number of countries	43		43		43	
R <sup>2</sup>	0.6832		0.5869		0.6413	
Adjust. R <sup>2</sup>	0.6207		0.4615		0.4867	
F-statistic	68.0028		41.8371		49.1742	
Prob(F-statistic)	0.0108		0.0006		0.0194	

Source: Authors’ computation, 2020. \*\*\* and \*\*shows significance at 1%, 5% and 10% levels, respectively.

Moreover, the analysis of the nonlinear relationship between public external debt and growth provides evidence to validate the result obtained in Table 6 about the debt Laffer curve relationship between public external debt and economic growth. As expected, interest rate and inflation exhibit a negative association with growth. Consistent with the results in Table 6, other control variables show their expected signs, respectively. The F-statistic of 68.0028 with a *p*-value of 0.0108 reveals that at the 5% level of significance, the model significantly explains the variability in economic growth captured as real GDP growth. The adjusted R<sup>2</sup> value of 0.6207 suggests that the explanatory variables in the study explain about 62% of the variability in economic growth. This result means that the remaining 38% of growth dependency could be a result of other factors. Although the R<sup>2</sup> improved in the robust analysis which gives a good account of the variables in the study, the result of the R<sup>2</sup> of 68% still suggests that certain explanatory variables such as weak institutional settings like the legal system and governance structure could explain much of the variation of economic growth in Africa. These variables involving the institutional and governance structure could also explain external debt mismanagement commonalities in African countries. The result of this study, therefore, confirms the fact that external debt is not in itself a bad economic policy, since other moderating variables could be responsible for it impacting positively on economic performance. Overall, the findings of this study signify the direction and strength of the relationship between external debt and economic growth in Africa.

#### 4.6. Diagnostic Test

Table 8 reports the result of the diagnostic tests. The result of the Breusch-Godfrey LM test, which reveals a t-statistic of 13.03025 and a *p*-value of 0.50477 demonstrates the absence of no serial correlation with the variables. The result shows that there is no issue regarding conditional heteroscedasticity, since the t-statistic is 17.53741 with a *p*-value of 0.15469. Statistically, the t-statistic of 4.11674 and *p*-value of 0.36601 suggests that the model is normally distributed at the 5% level of significance.

**Table 8.** Diagnostic tests.

Null Hypothesis	Test Method	<i>t</i> -Statistic	<i>p</i> -Value
No serial correlation	Breusch-Godfrey LM	13.0302	0.5047
No conditional heteroscedasticity	White (Chi-square)	17.5374	0.1546
There is normality	Jarque-Bera	4.1167	0.3660

Source: Authors' computation, 2020.

## 5. Concluding Remarks

This study examines the dynamic relationship between public external debt and economic growth in 43 selected Africa countries during the period 2001 to 2018. The study highlights the importance of efficient debt management to ensure economic growth and development in Africa. The study showcases the influence of external debt, investment, inflation, trade openness, human capital development, population growth and interest rates to explain economic growth in Africa. Specifically, this study finds evidence that public external debt negatively impacts economic growth in Africa. The study found a negative impact of inflation and interest rates on economic growth. Furthermore, the study reports a positive effect of human capital development, investment and trade openness on growth. The study confirmed the nonlinear relationship between public external debt and economic growth in Africa.

Importantly, the study shows that the influence of external debt on economic output could vary over time, which means the external debt is not entirely a weak policy instrument for economic development, mainly when applied adequately to economic activities that would lead to growth. However, the adverse impact of public external debt on economic growth is an indication that Africa countries continue to borrow without due consideration to the unfavourable terms of trade in their contracts. In addition, it shows the extent to which African leaders waste resources due to inept policies, weak governance and institutional structures in the public sector. The findings of this study have salient policy ramifications for policymakers, investors and development partners. As a matter of policy implication, African leaders must jettison policies that encourage borrowing under conditions that are not favourable. Development partners must have a robust monitoring mechanism to ensure efficient use of borrowed funds. African leaders must design policies to eschew waste of resources and strengthen both governance and institutional structures in the public sector to provide meaningful economic growth. Also, development partners need to encourage accountability and discourage countries from taking on more debt than desired.

Finally, this study is limited to the available dataset and the consequences of secondary data on public external debt in developing countries. The result of this study suggests that certain fundamental variables outside this work are also responsible for economic growth in developing nations. Apart from the GDP, economic performance can also be measured using the volume of export. Therefore, future research work needs to take account of these issues and other explanatory variables not considered in this study. It will be useful to consider the possibility of incorporating private external debt or domestic debt in future studies. Also, poor governance and institutional structures are issues that may have an influence on the external debt–growth relationship and would, therefore, require future research work.

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## Appendix A

**Table A1.** List of 43 African countries in the study sample.

Algeria	Congo Rep	Ghana	Mali	Rwanda	Uganda
Angola	Cote d'Ivoire	Guinea	Mauritania	Senegal	Zambia
Benin	DR Congo	Guinea Bissau	Mauritius	Sierra Leone	Zimbabwe
Botswana	Egypt	Kenya	Morocco	South Africa	
Burkina Faso	Ethiopia	Liberia	Mozambique	Sudan	
Burundi	Equatorial Guinea	Libya	Namibia	Tanzania	
Cameroun	Gabon	Madagascar	Niger	Togo	
Chad	Gambia	Malawi	Nigeria	Tunisia	

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