

# The Impact of Domestic Debt on Economic Growth in Sierra Leone (1973 to 2021)

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## To cite this article:

Sylvester Bob Hadji. The Impact of Domestic Debt on Economic Growth in Sierra Leone (1973 to 2021). *Journal of Investment and Management*. Vol. 12, No. 2, 2023, pp. 16-25. doi: 10.11648/j.jim.20231202.11

**Received:** May 2, 2023; **Accepted:** June 1, 2023; **Published:** September 14, 2023

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**Abstract:** The study investigates the impact of domestic debt on economic growth in Sierra Leone for the period covering 1973 to 2021. The study employs time series secondary data from various sources including the Central Bank of Sierra Leone, the Ministry of Finance and the World Bank Development Indicators. Key macroeconomic variables such as domestic debt-to-GDP ratio, domestic debt service-to-export earnings ratio, terms of trade and inflation were specified in the model employed in this study. The variables were tested for stationarity using unit root tests before applying Autoregressive Distributed Lag (ARDL) model in running the regression with a view to ascertaining both long run and short run effects of domestic debt variables on economic growth in Sierra Leone. Various diagnostic tests were carried out to appraise the robustness of the estimated growth equation using appropriate econometric criteria. The study empirically reveals a negative impact of domestic debt on economic growth in Sierra Leone for the period under study as clearly evident in the coefficients of the debt as a ratio of GDP, debt service as a ratio of export earnings and terms of trade. Clearly, both debt stock and debt service variables were found to generally exhibit negative impact on economic growth in the short run, as well as long run. The study, therefore, proffers strategic recommendations such as the need to review Sierra Leone's domestic debt management strategy and to promote private investment, among others.

**Keywords:** Domestic Debt, Domestic Debt Accumulation, Debt Service, Debt Overhang, GDP, Private Investment, Economic Growth

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## 1. Introduction

Domestic debt, also referred to as internal or home debt, is defined as debt owed to residents whether denominated in local or foreign currency. It could also be defined as the portion of the total government debt owed to creditors within the frontier of a country. Sierra Leone's domestic debt includes treasury securities (treasury bills and bonds), registered stocks and promissory notes, domestic suppliers' arrears, outstanding obligations owed to state-owned enterprises and Ways and Means Advances owed Central Bank of Sierra Leone [10].

Domestic debt is largely owed to holders of government securities such as treasury bills and treasury bonds. Tax is one of the sources of government revenue. In addition to tax, governments do raise revenue through borrowings (external and internal) and external grants. The sum of these revenue sources is often infinitesimal to the extent that it cannot cover

government expenditure implying expenditures exceed revenue. This situation brings about a gap called finance gap or budget (fiscal) deficit, which is usually characteristic of developing countries of which Sierra Leone is no exception. It is quite incumbent upon governments of these countries to finance such gap or deficit. To finance the deficit, governments normally resort to domestic borrowing since external borrowing is usually quite insufficient. Governments contract domestic debt for three cardinal purposes: budget deficit financing, financial market deepening and monetary policy implementation [4].

Unlike external debt which has historically obtained the required attention from international financial institutions and bilateral lenders, domestic debt has not received from the international development agencies the needed attention. Even the low income countries themselves did not give appreciable attention to the challenges and potential risks of national domestic debt until the late 1990s.

External debt sounds more difficult to be serviced or repaid as this requires payment in foreign currency compared to domestic debt which is repaid in local currency provided the stock of domestic debt is moderate. Massive utilisation of domestic debt poses an adverse effect on an economy since payment of the interest takes away a huge portion of government revenue. This will be particularly serious if the associated interest rates exceed those on the external debt.

Countries have small capital stocks at the early stages of their development in which case they are most probably exposed to investment opportunities where the rates of return may exceed those of developed countries. Growth is expected to increase and permit timely debt repayments provided these countries direct the borrowed funds to viable investments that are devoid of distorted economic policies and macroeconomic instability [13].

Sub-Saharan African Countries' domestic interest payments rose from 49.7 percent of the total debt service between 1990 and 1994 to 51.9 percent between 1995 and 2000. During the specified periods, the ratio of interest payments to gross domestic product (GDP) rose from 2.0 percent to 2.3 percent while the proportion of domestic interest payments to government revenue increased from 10.9 percent to 11.5 percent [5].

Developing countries, Sierra Leone inclusive, have low levels of national savings compared to advanced countries. Financial resources with commercial banks and other non-banking institutions (investors) are, therefore, limited. Increased demand for such limited resources has the tendency to drive up interest rates which represent the cost of borrowing. The credit available to the private sector is insufficient which largely undermines private investment. Governments also compete with the private sector for private savings whose resultant effect is crowding out of private sector investment. An examination of the crowding out effect of domestic debt on private sector credit for 27 Sub-Saharan African countries for the period 1980 to 2000 revealed a significant evidence [5].

Economic theory suggests that developing countries will achieve economic growth if they utilise reasonable amounts of borrowing in a productive manner. Borrowed amounts need to be repaid with interest which often leaves developing countries with little or no savings to finance domestic investment. Various studies show that investment and growth are constrained by low levels of national savings and foreign exchange earnings. Rather than relying on domestic savings and exports only, borrowing enhances higher levels of investment and imports.

## 2. Causes of Domestic Debt Problem in Sierra Leone

The causes of domestic debt problem in Sierra Leone include the following:

*High budget deficit:* The revenue government raises domestically is not enough to run the economy. The

persistent low revenue performance and the non-forthcoming of donor funds put together leaves the government with no option but to resort to borrowing from the domestic market.

*Low level of output:* The country's productivity level is too low which translates into low export level and low level of foreign exchange earnings.

*High interest rate in the domestic market:* The interest rates domestic market charges on loans are usually high making it difficult to repay the debt. New loans are usually procured in the bid to clear the old loan.

*High level of inflation:* In the bid to mobilise funds domestically, government may issue "indexed bond" to a creditor. In most cases, such bonds are indexed with inflation. Most times, the inflation rate is anticipated based on existing trends. For instance, it can be agreed that upon maturity of the bond, repayment is: Inflation + 2% margin. If inflation is higher than anticipated, the debtor (government) will be disadvantaged and this adds to the domestic debt stock.

*Crystallisation of contingent liabilities of state owned enterprises:* Sometimes, state owned enterprises may exceed budgetary allocation expenditures and may eventually decide to undertake significant programmes out of the budget (contingent liability). The government functions as a guarantor for the state owned enterprises in securing loans from financial institutions. The repayment of this loan is the responsibility of the state owned enterprises but when they default, the debt crystallises and becomes an obligation on the government which can serve as an addition to the domestic debt stock.

*Bailout cost incurred by government through domestic borrowing:* When a government owned institution is on the verge to collapse, the government may resort to domestic mobilisation of funds, say, loans, in the bid to rejuvenate the said institution, a process called government bailout. The cost incurred through this process adds on to domestic debt level.

*Accumulation of domestic contractors and suppliers' arrears:* Sometimes, government may pile up payments owed to contractors and suppliers over a considerable time period. In the case where the domestic revenue is unavailable or inadequate to make such payments, government may resort to domestic borrowing which can increase the country's domestic debt stock.

## 3. Literature Review

### 3.1. Theoretical Literature

According to World Bank and IMF [17], massive employment of domestic borrowing can bring about adverse effects on an economy as debt servicing occupies a greater portion of government revenue. This could be more serious if the domestic interest rates exceed the foreign interest rates. A rise in outstanding debt stock directly translates into an increase in the interest cost of domestic borrowing particularly in economies with shallow financial markets.

Private investment crowding out could result from domestic debt financing just as in the case of external debt

financing. Domestic private savings (a good source of revenue for private sector investment) are usually tapped by governments when they choose to borrow internally. This situation causes a negative impact on private investment and economic growth. Domestic borrowing can lead to credit rationing and crowding out of private sector investment if even interest rates are regulated [8].

Theoretically, crowding out process stems from heavy borrowing by governments from domestic markets. The rise in the level of borrowing (increased demand for investible funds) drives up domestic interest rates which consequently reduces private borrowing and private investment. A strong debate exists in economic theory and policy as to whether private and public investments are substitutes and compliments.

'Debt overhang' theory suggests the most preferred explanation why large stocks of accumulated debt in developing countries cause reduced economic growth. The theory explains that if there is a tendency for debt magnitude to exceed the ability of a country to repay in the future, the costs of the anticipated debt service will then impede economic growth by discouraging both domestic and foreign investments [7, 12]. Potential investors are scared away by large stock of debt as they interpret it to be a huge tax on their future incomes in the bid to service the debt.

Sichula, M. [15] states that debt overhang which obtains at the peak of 'Debt Laffer Curve' can hinder the performance of an economy if investment quality is altered in that the anticipated future taxes on the private sector will rise as the debt service burden heightens which limits private investment. Put another way, debt servicing consumes greater part of the resources that would otherwise have been employed for investment financing.

Ajayi, E. A. [3] attributes Nigeria's origin of debt problems to the persistent suffering of the international oil market, 1981 international oil price collapse and partly as a result of domestic lapses. Credit facilities gradually dried up as a result of the debt problem which rendered stalled a number of projects. According to him, the most sustainable remedy to the debt problem was the revival of the economy's growth.

Sheikh, M. R. et al. [14] observe that governments in developing countries use public debt in financing their expenditures. They realise that economic growth, which is one of the macroeconomic goals, will be enhanced if the borrowed funds are effectively and efficiently managed. Contrarily, economic growth would be constrained if the borrowed funds (public debt) are improperly utilised.

### 3.2. Empirical Review

A number of empirical studies have been conducted to investigate the causes of domestic debt and to examine the effects of domestic debt accumulation on economic growth in developing countries. The domestic debt- economic growth relationship has, over time, revealed mixed results. While some studies show that domestic debt impacts negatively on economic growth, others show the impact to be positive.

Adoufu, I., and M. Abula. [2] conduct an empirical study on the relationship between domestic debt and economic growth in Nigeria using the ordinary least square (OLS) regression technique and time series data spanning between 1986 and 2005. They find out that domestic debt negatively (adversely) impacted on the economic growth in Nigeria.

Onyeiwu, C. [11] examines the relationship between domestic debt and economic growth in Nigeria using OLS and error correction model for the period 1994-2008 to analyse quarterly data. The empirical result shows a negative relationship between debt and economic growth.

Christensen, J. [5] conducts a research on the effect of domestic debt on private investment and government budgets and concluded that the worsening of government budgets in Sierra Leone, Ghana, Zimbabwe, Malawi and The Gambia was as a result of the colossal rise in their domestic interest payments which prompted them to set aside 15 percent of their revenues for the settlement of their domestic debt interest payments. Given the high level of domestic debt burden, huge stock of external debt and the degree of financial intermediation in the said countries, he further opined that additional utilisation of domestic debt, which is virtually inevitable, has high tendency of crowding out private investment which in turn affects growth negatively.

Abass, S. M., and J. Christensen. [1] use Granger Causality Regression model to analyse optimal domestic debt levels in emerging markets and low income countries for the period 1975- 2004. The empirical result shows that moderate levels of marketable domestic debt as a percentage of GDP impacted positively and significantly on economic growth. The study also revealed that economic growth would be negatively impacted if debt stock levels exceed 35% of total bank deposits.

Sheikh, M. R. et al. [14] using the OLS technique examine the impact on economic growth of domestic debt in Pakistan between 1972 and 2009. The study reveals a positive relationship between domestic debt stock and economic growth in Pakistan. The study also shows a negative relationship between domestic debt servicing and economic growth. The findings of the study show that the positive impact on economic growth of domestic debt is less than the impact on economic growth of domestic debt servicing.

Malik, K., and R. Atique. [9] investigate the impact of domestic debt on economic growth in Pakistan for the period 1980-2010 using the autoregressive distributed lag (ARDL). The finding reveals an inverse relationship between domestic debt and economic growth.

Uzochukwu, A. [16] examines the relationship between domestic debt and economic growth in Nigeria for the period 1980 to 2010 using ARDL. The finding reveals a negative impact of domestic debt on the economic growth in Nigeria for the period of study.

Damian, K. U., and S. E. Chukwunonso. [6] examine empirical issues regarding the structure and composition of Nigeria's domestic debt and its effect on private investment for the period spanning from 1970- 2012 using secondary data and multiple regression models. The findings of the

study reveal that domestic debt has a significant negative effect on Nigeria's domestic private investment for the period of study. The findings also reveal a significant negative impact on foreign private investment of domestic debt with debt servicing and exchange rate showing positive impact on foreign private investment.

#### 4. Model Specification, Description of Variables and Estimation Procedures

A typical procedure for every good research that uses econometric technique is to emphasize the significance of looking into data producing process underlying the variables before estimating the parameters and doing different hypothesis tests. With the use of this approach, the issue of erroneous correlation between variables in a regression equation is intended to be avoided.

When making estimates with time series data, the Ordinary Least Squares (OLS) method makes the assumption that the data are stationary. We define stationarity as the absence of a systematic change in the moments of the distribution (mean, variance, etc.) across time. This has not always been the case since autocorrelation, a likely cause of non-stationarity, may be present in the error terms resulting from subsequent observations. If the moments of the distribution used to draw a series of observations are not constant (i.e., not time invariant), but instead vary on the time point at which the observations were made, the series is said to be non-stationary. We must first establish if a variable is steady before we can test such a claim.

##### Unit Root Test

Unit root tests of the variables in a model will be run to ascertain their time series qualities in accordance with recent advancements in time series modeling. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests will be used to determine the order of integration of each series. The ADF test equation is given as:

$$\Delta x_t = \alpha + \delta x_{t-1} + \dots \sum_{i=1}^k \delta_i \Delta x_{t-i} + \dots \delta_m \Delta x_{t-m} + \varepsilon_t \quad (1)$$

$$\Delta x_t = \alpha + \beta_t + \delta x_{t-1} + \dots \sum_{i=1}^k \delta_i \Delta x_{t-i} + \dots \delta_m \Delta x_{t-m} + \varepsilon_t \quad (2)$$

While equation (1) has an intercept but no time trend, equation (2) has both an intercept and a time trend. A constant is denoted by  $\alpha$ ; an autoregressive process coefficient is denoted by  $\delta$ ; a difference operator is denoted by  $\Delta$ ; a time trend is denoted by  $t$ ; a variable is denoted by  $x_t$ ; a number of lags is denoted by  $k$ ; and a stochastic error term is denoted by  $\varepsilon_t$ . To reduce autocorrelation issues in the disturbance term, the test model is supplemented with lag differences of the variables. The ideal lag length  $k$  in equations (1) and (2) is established using the Schwarz Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC).

The Phillips-Perron test equation is similar to the Augmented Dickey-Fuller test but the lag  $k$ , is omitted to adjust for the standard error in view to correct for

heteroscedasticity and autocorrelation. Consequently, The PP test equation is specified as:

$$\Delta x_t = \alpha + \delta x_{t-1} + \dots \sum \delta_i \Delta x_{t-i} + \dots \delta_m \Delta x_{t-m} + \varepsilon_t \quad (3)$$

The tests rely on rejecting the null hypothesis of a unit root (the series are non-stationary) in favour of the alternative hypothesis of no unit root (the series are stationary). We reject the null hypothesis of non-stationary and get to the conclusion that the series is stationary if the absolute values of the ADF and PP test statistics are higher than the critical values. On the other hand, if the absolute values of the ADF and PP statistics fall below the critical levels, we are unable to rule out the null hypothesis and come to the conclusion that the series is non-stationary.

##### Bounds Test of Co-integration and Error Correction Model

Here, the study employs the Autoregressive Distributed Lag (ARDL) approach to estimate the models. An ARDL model is a dynamic model which uses lags of the explained and explanatory variables to estimate the short-run effects and also the long-run equilibrium relationship between the variables using a single equation.

For our empirical study, *to achieve the empirical objective (i.e. impact of domestic debt on economic growth in Sierra Leone)*, we develop an autoregressive distributed lag (ARDL) model based on a modified neoclassical growth function to examine the dynamic relationship between the dependent variable (economic growth) and domestic debt (stock of current domestic debt inflow, domestic debt service, export growth, fiscal deficit, inflation, private investment, public investment and terms of trade).

$$\text{GDPGR} = f(\text{DDGDP}, \text{DDSEXP}, \text{EXPGR}, \text{FDGDP}, \text{INF}, \text{PRINVGDP}, \text{PUINVGDP}, \text{TOT}) \quad (4)$$

Where all the variables are expressed in logarithmic form:

GDPGR = GDP growth rate

DDGDP = stock of current domestic debt inflow to GDP ratio

DDSEXP = domestic debt service as a ratio of export earnings (i.e., 'crowding out' effect)

EXPGR = export growth

FDGDP = fiscal (budget) deficit to GDP ratio

INF = rate of inflation

PRINVGDP = private investment as a ratio of GDP

PUINVGDP = public investment as a ratio of GDP

TOT = terms of trade

The model, equation (5), is simply constructed to capture the nexus between economic growth and domestic debt with the inclusion of control variables that have impact on it.

$$\begin{aligned} \ln \text{GDPGR}_t = & \beta_0 + \beta_1 \ln \text{DDGDP}_t + \beta_2 \ln \text{DDSEXP}_t + \beta_3 \\ & \ln \text{EXPGR}_t + \beta_4 \ln \text{FDGDP}_t + \beta_5 \ln \text{INF}_t + \beta_6 \ln \text{PRINVGDP}_t + \\ & \beta_7 \ln \text{PUINVGDP}_t + \beta_8 \ln \text{TOT}_t + \varepsilon_t \end{aligned} \quad (5)$$

To study the short run and long run relationship between our variables, the equation (5) is transformed into an Error Correction Model form of the ARDL model. This is

represented by equation (6).

$$\begin{aligned} \Delta \ln GDPGR_t = & \beta_0 + \sum_{i=1}^p \beta_1 \Delta \ln GDPGR_{t-1} + \sum_{i=1}^p \beta_2 \Delta \ln DDGDP_{t-1} + \\ & \sum_{i=1}^p \beta_3 \Delta \ln DDSEXP_{t-1} + \sum_{i=1}^p \beta_4 \Delta \ln EXPGR_{t-1} + \\ & \sum_{i=1}^p \beta_5 \Delta \ln FDGDP_{t-1} + \sum_{i=1}^p \beta_6 \Delta \ln INF_{t-1} + \\ & \sum_{i=1}^p \beta_7 \Delta \ln PRINV GDP_{t-1} + \sum_{i=1}^p \beta_8 \Delta \ln PUINV GDP_{t-1} + \\ & \sum_{i=1}^p \beta_9 \Delta \ln TOT_{t-1} + \delta_1 \ln GDPGR_{t-1} + \delta_2 \ln DDGDP_{t-1} + \\ & \delta_3 \ln DDSEXP_{t-1} + \delta_4 \ln EXPGR_{t-1} + \delta_5 \ln FDGDP_{t-1} + \\ & \delta_6 \ln INF_{t-1} + \delta_7 \ln PRINV GDP_{t-1} + \\ & \delta_8 \ln PUINV GDP_{t-1} + \delta_9 \ln TOT_{t-1} + \lambda ECM_{t-1} + \varepsilon_t \quad (6) \end{aligned}$$

One of the main reasons for using the ARDL model estimation technique is to employ the bounds test. It helps in examining the long run relationship between our variables. The bounds test is employed to test for co-integration in an ARDL model.

From the equation (6), the coefficients  $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6, \delta_7, \delta_8, \delta_9$  represent the long run relationship in the model. To perform the bounds test on the equation (6) given the long-run coefficients, the F-statistic will be used to test the following hypothesis:

$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 = 0$  Null hypothesis of no co-integration against the alternative,

$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq \delta_8 \neq \delta_9 \neq 0$  existence of a co-integration.

The result of bounds test provides a joint F-statistic, lower bound critical value and upper bound critical value. To test the hypotheses above, we examine the calculated F-statistic against the critical values. If the estimated F-statistic is greater than the upper bound critical value, we reject the null hypothesis,  $H_0$ , and finalise that our variables are co-integrated. However, if the F-statistic falls below the lower bound critical value we cannot reject the null hypothesis,  $H_0$ . That will mean there is no long run relationship between our variables.

After confirming the existence of a long-run relationship between our variables from the bounds test, we can then move on to estimating the long and short-run coefficients. To this end, equation (6) is transformed to capture the short-run dynamics as can be seen in the equation (7).

From the equation (4), we derive an Error Correction Model to help us measure the short run impacts of domestic debt on economic growth as shown in equation (7).

$$\begin{aligned} \Delta \ln GDPGR_t = & \alpha_0 + \sum_{i=1}^{m_1} \partial_i \Delta \ln GDPGR_{t-1} + \sum_{i=0}^{m_2} \partial_i \Delta \ln DDGDP_{t-1} + \\ & \sum_{i=0}^{m_3} \theta_i \Delta \ln DDSEXP_{t-1} + \sum_{i=0}^{m_4} \tau_i \Delta \ln EXPGR_{t-1} + \\ & \sum_{i=0}^{m_5} \gamma_i \Delta \ln FDGDP_{t-1} + \sum_{i=0}^{m_6} \phi_i \Delta \ln INF_{t-1} + \\ & \sum_{i=0}^{m_7} \varphi_i \Delta \ln PRINV GDP_{t-1} + \sum_{i=0}^{m_8} \vartheta_i \Delta \ln PUINV GDP_{t-1} + \\ & \sum_{i=0}^{m_9} \psi_i \Delta \ln TOT_{t-1} + \lambda ECM_{t-1} + \varepsilon_t \quad (7) \end{aligned}$$

The equation (7) represents the short run dynamics of ARDL error correction form. The lags of our explained and explanatory variables are captured.

After establishing the long-run relationship between our variables, we move on to test for the short-run dynamics as in equation (7). The short run dynamics is adjusted to capture a one period lag of the error correction term. The Error Correction term,  $ECT_{-1}$ , is the speed of adjustment parameter which explains the rate at which our variables return to their long run equilibrium after an exogenous shock. A negative Error Correction term signifies effective feedback. That is, there is a quick convergence to the long run equilibrium after a disequilibrium or shock. A positive Error Correction term means a slower feedback or divergence from the long run equilibrium after a shock. If the Error Correction term is zero, then there is no adjustment.

## 5. Presentation and Analysis of Empirical Results

### 5.1. Correlation Results

A straightforward correlation study between economic growth and the explanatory variables was conducted before estimating the regressions for the model. In Table 1, the results are presented. The table demonstrates that there is a moderately negative association between GDP growth rate and domestic debt, as well as between GDP growth and domestic debt service to export ratio.

Inflation (INF), terms of trade (TOT), and economic growth (GDPGR) are all negatively correlated. As would be predicted, there is a moderate but positive association between economic growth, private investment, public investment, and export growth. Both domestic debt and the domestic debt service to export ratio have a negative association with the budget deficit (FDGDP).

Table 1. Correlation matrix of model.

	GDPGR	DDGDP	DDSEXP	EXPGR	FDGDP	INF	PRINV GDP	PUINV GDP	TOT
GDPGR	1.0000								
DDGDP	-0.3116	1.0000							
DDSEXP	-0.2709	0.5477	1.0000						
EXPGR	0.0925	0.0604	0.0166	1.0000					
FDGDP	0.2249	-0.2361	-0.0660	-0.115	1.0000				
INF	-0.2612	0.1067	0.0027	-0.3720	-0.0306	1.0000			
PRINV GDP	0.0638	-0.2451	-0.2284	-0.0393	0.0247	0.2777	1.0000		
PUINV GDP	0.4264	-0.4484	-0.3536	-0.0592	0.1357	-0.0639	0.1347	1.0000	
TOT	-0.4591	0.0805	-0.1967	0.1005	-0.2421	0.0686	-0.0996	-0.5246	1.0000

In Table 1, there is absence of multicollinearity among the variables in the model. This is supported by Kennedy (2008)

who suggested a threshold of a correlation coefficient of above 0.7, arguing that if the coefficient is above this level, it

could cause a serious multicollinearity problem leading to inefficient estimation and less reliable results. In this study the estimates are all below 0.70 and therefore the variables are maintained.

### 5.2. Unit Root Test Results

Table 2 presents the results of unit root tests based on the Augmented Dick Fuller test (ADF) and Phillips-Perron (PP) and the findings are discussed. According to the unit root tests, it is noted that GDP growth is stationary since the ADF test statistic of negative 5.5106 is less than the critical value at 5%. The p-value is less than 0.05. The null hypothesis

states that the variable has unit root, or it is non-stationary which means p-value is greater than 0.05. In this case the p-value is 0.00 implying that the null hypothesis is rejected. This is also the case with export growth, inflation, public investment and budget deficit variables whose p-values are less than or equal to the critical value at 5% and therefore stationary at level i.e. Integrated of order I(0). Thus, the null hypothesis is again rejected for these two variables at level. On the other hand, four variables, namely domestic debt, domestic debt service, terms of trade and private investment were stationary at first difference thus integrated of order I(1).

*Table 2. Unit root tests for model.*

#### *Augmented Dickey-Fuller (ADF) Tests*

Variable	Level/ $\Delta$ Level	Constant and No Trend		Constant and Trend		Conclusion
		Test Statistics	ADF critical values (5%)	Test Statistics	ADF critical values (5%)	
GDPGR	Level	-5.5106**	-2.9281	-6.1094**	-3.5131	I(0)
DDGDP	Level	-2.8966	-2.9281	-3.0345	-3.5131	I(1)
	$\Delta$ Level	-7.9858**	-2.9297	-7.9487**	-3.5155	
DDSEXP	Level	-1.9459	-2.9297	-1.9393	-3.5155	I(1)
	$\Delta$ Level	-13.2411**	-2.9297	-13.1603**	-3.5155	
EXPGR	Level	-5.4709**	-2.9281	-5.5179**	-3.5131	I(0)
TOT	Level	-2.7261	-2.9281	-3.0274	-3.5131	I(1)
	$\Delta$ Level	-6.7524**	-2.9314	-6.6648**	-3.5181	
INFL	Level	-4.0039**	-2.9281	-4.3642**	-3.5131	I(0)
PRINVGDP	Level	-1.3718	-2.9331	-9.6341**	-3.5181	I(1)
	$\Delta$ Level	-7.3622**	-2.9331	-18.1807**	-3.5181	
PUIVGDP	Level	-2.9444**	-2.9281	-3.5954**	-3.5131	I(0)
FDGDP	Level	-4.0736**	-2.9281	-4.1889**	-3.5131	I(0)

#### *Phillips-Perron (PP) Tests*

Variable	Level/ $\Delta$ Level	Constant and No Trend		Constant and Trend		Conclusion
		Test Statistics	PP critical values (5%)	Test Statistics	PP critical values (5%)	
GDPGR	Level	-5.7921**	-2.9281	-6.1918**	-3.5131	I(0)
DDGDP	Level	-2.8966	-2.9281	-2.9822	-3.5131	I(1)
	$\Delta$ Level	-8.7569**	-2.9281	-9.2293**	-3.5131	
DDSEXP	Level	-3.9715**	-2.9281	-3.9272**	-3.5155	I(0)
EXPGR	Level	-5.3611**	-2.9281	-5.6073**	-3.5131	I(0)
TOT	Level	-2.6485	-2.9281	-2.9930	-3.5131	I(1)
	$\Delta$ Level	-7.7529**	-2.9297	-7.6314**	-3.5155	
INFL	Level	-4.0039**	-2.9281	-4.3533**	-3.5131	I(0)
PRINVGDP	Level	-5.8690**	-2.9281	-5.8914**	-3.5131	I(0)
PUIVGDP	Level	-2.9444**	-2.9281	-3.5954**	-3.5131	I(0)
FDGDP	Level	-3.9931**	-2.9281	-4.0392**	-3.5131	I(1)

### 5.3. Optimal Lag Length for the Model

To enable us estimate and decide the most optimal lag length for the model and for the variables, it is imperative that we establish an estimate of a VAR to select the appropriate number of lags to be included in the models. The literature prescribes five different criteria for optimal lag length selection namely, Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hanna-Quinn information criterion (HQ). The result of the optimal lag length is presented in Table 3. The result shows that the optimal lag length is zero (0) based on the selection criteria. Thus, the study uses zero (0) lag for each variable in the

model based on the AIC criteria.

### 5.4. Co-integration Test

Based on the unit root test results presented in Table 2, we performed co-integration test using the Auto Regressive Distributed Lag (ARDL) model. The objective for the co-integration test is to ascertain the existence of a long run relationship between the endogenous and exogenous variables. The decision rule is that the null hypothesis is rejected if the F-statistic exceeds the upper bound (limit) at the 1%, 5% and 10% significance levels; otherwise, we confirm there is no co-integration. From the result presented in Table 4, the F-statistic (6.639659) is found to be greater than the upper bound (1), at the 1% and 5% levels of

significance. Therefore, the study concludes that there is co-integration, indicating that there exists a long run relationship among the variables.

**Table 3.** Optimal lag selection for the model.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-40.13266	NA*	0.647977*	2.396715*	2.772865*	2.533688*
1	-39.19377	1.419783	0.651715	2.399696	2.817640	2.551888
2	-38.89271	0.440566	0.676634	2.433791	2.893530	2.601202
3	-38.89107	0.002318	0.713370	2.482491	2.984025	2.665122
4	-38.62861	0.358483	0.743211	2.518469	3.061797	2.716319
5	-38.20497	0.557968	0.768954	2.546584	3.131706	2.759653

\* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SIC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

**Table 4.** ARDL Bounds Test for the model.

Test Statistic	Value	K
F-statistic	<b>6.639659</b>	<b>8</b>
Critical Value Bounds		
Significance	I(0)	I(1)
10%	1.85	2.85
5%	2.11	3.15
2.5%	2.33	3.42
1%	2.62	3.77

### 5.5. ARDL Long Run Results

**Table 5.** Long run coefficient estimation of ARDL (1, 0, 1, 1, 0, 0, 0, 0) for the model.

Dependent Variable: lnGDPGR				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnDDGDP	-0.389586	0.172484	-2.258680	0.0251**
lnDDSEXP	-0.483591	0.112696	-4.291111	0.0000***
lnEXPGR	-0.974419	0.104922	-9.287108	0.0000***
lnFDGDP	-0.937900	0.446063	-2.102617	0.0593*
lnINF	-0.123778	0.058176	-2.127642	0.0348**
lnPRINVGDP	0.470714	0.206192	2.282885	0.0292**
lnPUINVGDP	0.106095	0.209772	0.505764	0.6165
lnTOT	-0.987812	0.318741	-3.099104	0.0040***
C	-0.026081	1.909077	-0.013661	0.9892

Source: Authors's computation

Note: \*, \*\*, \*\*\* means significance at the 10, 5 and 1 percent levels respectively. The results are from the ARDL (1, 0, 1, 1, 0, 0, 0, 0) model 2

Given that the bounds test revealed the existence of co-integration when lnGDPGR was used as an endogenous variable, the equation was hence estimated for the long run coefficients. From Table 5, the long run result is reported using AIC and the result revealed a negative relationship between domestic debt and economic growth with statistically significant coefficient at the 5% significance level.

It was also discovered that the relationship between economic growth and the ratio of domestic debt servicing to export was unfavorable over time. According to the findings, economic growth will fall by 0.483% for every 1% increase in domestic debt service. At the 5% level of significance, it was discovered that the domestic debt service coefficient was statistically significant. The crowding out effects brought on

by an increase in domestic debt are the most significant negative impact of domestic debt service.

Export growth (EXPGR) negatively impacted economic growth in the long run. The coefficient (-0.9744) is statistically significant.

Over time, the government's budget deficit (FDGDP) had a detrimental impact on economic expansion. Economic growth will fall by 0.937% for every % 1 increase in the budget deficit. However, at the 5% level, the P-value of the budget deficit is not statistically significant but significant at the 10% level. As a result, we draw the conclusion that the budget deficit has long-term impact on economic growth and fail to reject the null hypothesis.

Economic growth and inflation (INF) were proven to be mutually exclusive over the long term. According to the

findings, economic growth will fall by 0.123% for every 1% increase in inflation. At the 5% level of significance, it was discovered that the coefficient of inflation rate was statistically significant. The adverse impact of inflation indicates that a high inflation rate is detrimental to Sierra Leone's economic growth.

Economic growth and private investment (PRINVGDGP) were found to be positively correlated throughout time. According to the findings, an increase of 1% in private investment will result in an increase of 0.470% in economic growth. At the 5% level of significance, it was discovered that the coefficient of private investment was statistically significant.

Long-term economic growth was positively impacted by public investment (PUINVGDGP). Economic growth will improve by 0.106 % with a 1% increase in public investment. However, at the 5% level, the P-value of public investment is not statistically significant. As a result, we draw the

conclusion that public investment has no long-term impact on economic growth and fail to reject the null hypothesis.

It was also discovered that the relationship between economic growth and the terms of trade was unfavorable over time. According to the findings, economic growth will fall by 0.987% for every 1% increase in terms of trade. At the 5% level of significance, it was discovered that the terms of trade coefficient were statistically significant.

### 5.6. ARDL Short Run Results

The findings in Table 6 demonstrate that economic growth in earlier time periods influences economic growth in the present. At the 5% level, the effect is statistically significant and positive (0.077549). Economic growth will increase by 0.077% in the short term or present period for every 1% increase in growth from the preceding period.

Table 6. ARDL Short run estimation of the model.

Dependent Variable: $\Delta \ln \text{GDPGR}$				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.970067	0.566263	5.245035	0.0000***
D(lnGDPGR(-1))	0.077549	0.018933	4.095856	0.0000***
D(lnDDGDP)	-0.072715	0.022684	-3.205511	0.0014***
D(lnDDSEXP)	-0.146174	0.026786	-5.457064	0.0000***
D(lnEXPGR)	0.117285	0.028360	4.135590	0.0000***
D(lnFDGDP)	-0.119045	0.037490	-3.175371	0.0016***
D(lnINF)	-0.525716	0.454042	-1.157857	0.2552
D(lnPRINVGDGP)	0.163459	0.062539	2.613722	0.0097***
D(lnPUINVGDGP)	-0.059673	0.190203	-0.313735	0.7557
D(lnTOT)	0.143238	0.382227	0.374746	0.7102
ECM(-1)	-1.435286	0.221217	-6.488150	0.0000***
R-squared	0.691853	Mean dependent var		0.000000
Adjusted R-squared	0.598476	S.D. dependent var		1.131272
S.E. of regression	0.716842	Akaike info criterion		2.384394
Sum squared resid	16.95744	Schwarz criterion		2.830441
Log likelihood	-41.45667	Hannan-Quinn criter.		2.549810
F-statistic	7.409190	Durbin-Watson stat		2.267664
Prob(F-statistic)	0.000005			

Additionally, it is evident that domestic debt (DDGDP) had a short-term detrimental impact on economic growth. The impact is significant statistically and is strong. Short-term economic growth will decline by 0.072% for every 1% increase in domestic debt.

In the short run, economic growth is negatively and statistically impacted by domestic debt service as a ratio of export (DDSEXP). Economic growth will decline by 0.146% as a result of a 1% rise in domestic debt service.

In the short-term, export growth (EXPGR) impacted economic growth positively and the coefficient is statistically significant. The correlation value is 0.11728. Accordingly, a 1% increase in export growth will result in a 0.117% rise in GDP growth. This explains why there has been an increase in economic growth due to an increase in export growth.

Economic growth and government budget deficit (FDGDP) were found to be negatively correlated in the short term. The findings indicate that a 1% increase in the budget deficit will result in a 0.119% decline in economic growth. At the 5%

level of significance, it was discovered that the budget deficit coefficient was statistically significant. The adverse impact of the budget deficit shows that a large deficit is detrimental to Sierra Leone's ability to build its economy.

It was discovered that inflation (INF) and economic growth are negatively correlated in the short run. The findings indicate that a 1% increase in inflation will result in a 0.525% fall in economic growth. For the short run, it was discovered that the coefficient of inflation rate was not statistically significant at the 1% level of significance. However, the adverse impact of inflation indicates that a high inflation rate is detrimental to the growth rate of the Sierra Leone economy.

Unlike inflation, private investment (PRINVGDGP) was found to have a positive short run relationship with economic growth. The results show that a 1% increase in private investment will lead to 0.163% increase in economic growth. The coefficient of the private investment was found to be statistically significant at the 5% level of significance.



Unlike private investment, public investment (PUINVGDGP) deteriorated short-term economic growth. Economic growth will be worsened by 0.059% with a 1% increase in public investment. The P-value of public investment is, however, not statistically significant. As a result, we draw the conclusion that public investment has no impact on economic growth in the short term and consequently fail to reject the null hypothesis.

The result for terms of trade (TOT) had a positive effect on economic growth in the short run. A 1% increase in the terms of trade will lead to a 0.143% increase in economic growth. However, the P-value of the terms of trade is not statistically significant. Therefore, we fail to reject the null hypothesis and conclude that terms of trade do not affect economic growth in the short run.

Table 7 shows the results of the diagnostic tests performed on the predicted ARDL model. Results are as follows:

- 1) The null hypothesis, which assumes there is no serial correlation in the model, cannot be ruled out in the

Breusch-Pagan-Godfrey serial correlation test because the probability value is greater than 5% (p-value = 0.1093>0.05).

- 2) The null hypothesis, which states that there is no heteroscedasticity in the model, cannot be rejected in the Breusch-Pagan-Godfrey test at a 5% significance level because the probability value is greater than 5% (p-value = 0.1177>0.05).
- 3) In the Ramsey-RESET test, using a 5% significance level, the null hypothesis assuming no specification (identification) error in the model cannot be rejected (p-value>0.05), so it can be concluded that the model does not yield any specification error.
- 4) In the Jarque-Bera test, at a 5% significance level, the null hypothesis which indicates the residual distribution is normal cannot be rejected as prob>0.05 (0.43657>0.05). Thus, it was concluded the residues of the ARDL (1, 0, 1, 1, 0, 0, 0, 0, 0) model are normally distributed.

Table 7. Diagnostic tests.

Diagnostic Tests	Statistic	p-value
Breusch-Godfrey Serial Correlation LM Test	2.712773 (F-stat.)	0.1093
Heteroscedasticity Test: Breusch-Pagan-Godfrey	1.719595 (F-stat.)	0.1177
Heteroscedasticity Test: ARCH	0.031426 (F-stat.)	0.8602
Ramsey RESET Test	1.095250 (F-stat.)	0.3032
Normality Test (Jarque-Bera)	1.657594 (JB-stat.)	0.43657

## 6. Policy Recommendations

Based on the findings, the study has proffered the following strategic recommendations towards ensuring prudent domestic debt management for enhanced economic growth and sustainable development in Sierra Leone:

*Review of domestic debt management strategies:* There is an urgent need to review Sierra Leone's domestic debt management strategies to ensure that domestic debt is directed towards productive capital projects supportive of private investment and economic growth rather than financing short term government recurrent expenditures.

*Promote private sector investment:* It is necessary to promote private investment aimed at boosting productivity in the economy which will help reduce import and reduce demand for foreign exchange so that the cost of debt can be reduced overtime. The Government should ensure that the business environment is politically stable and investors are given equitable treatment. With this effort, investment level will rise which will in turn lead to an increase in returns to investment/ GDP critical to economic growth. This will put a downward pressure on the country's interest in procuring public debt to finance development projects.

*Receipt of non-debt foreign exchange:* The government should encourage the receipt of non-debt foreign exchange such as that from tourism. To achieve this, government should create enabling environment for tourist attraction.

*Exchange rate stabilisation:* Government should adopt strategies to stabilise exchange rate coupled with macroeconomic policy that avoids inflation in the country. This will be achieved by boosting domestic production of goods which will encourage exports and facilitate import substitution as most of the goods previously imported will now be produced domestically. A reduction in imported goods will reduce demand for foreign exchange while increase in exports facilitates inflow of foreign exchange. With this, foreign earnings from exports will be expected to exceed those expended on imports. A continuous process of this will stabilise the exchange rate. Stable exchange rate reduces the cost of financing debt.

*Scaled-up revenue generation:* Tax revenue is one of the sources of domestic finance for economic growth and development. Governments should therefore, increase their efforts to enhance tax revenues through efficient tax collection, effectively combating tax evasion, broadening the tax base and modernised tax systems.

*Maintenance of political stability:* The government of Sierra Leone should continue to maintain political stability in the country. Government should provide conducive business environment. Investors will be scared away from investing in countries plagued with political instability.

*Minimisation of corruption:* Corruption which is one of the internal causes of debt crisis in the country must be minimised. The government should ensure that accountability, good governance and transparency exist in all sectors of the country. This process must be monitored

by the Office of the Anti-Corruption Commission and culprits, irrespective of status, should face the full force of the law.

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