

# An Investigation of the Impact of Inflation and Budget Deficit as Co-Crises on Economic Growth in Sierra Leone

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## ABSTRACT

High inflation rates and persistent budget deficits represent formidable structural challenges for Sierra Leone, predominantly driven by exogenous macroeconomic shocks and fiscal-monetary policy misalignments. These imbalances have disrupted growth, particularly in 2024, when inflation reached 29.45% and budget deficit (excluding grants) rose to NLe8.6 billion (about \$376.37 million). This research investigates the impact of inflation and budget deficits as co-crises on economic growth in Sierra Leone for the period 1980 to 2024. Using time-series secondary data sourced from the World Bank's World Development Indicators Database, Statistics Sierra Leone, and the Central Bank of Sierra Leone, the research employs an Autoregressive Distributed Lag (ARDL) technique. Real Gross Domestic Product, which is the dependent variable; Inflation (measured by the consumer price index) and Budget Deficits (measured as a percentage of gross domestic product), which are the key independent variables; are incorporated into the model. Unit root tests were conducted for stationarity through Augmented Dickey-Fuller and Phillips-Perron tests, while diagnostic tests were performed to ensure absence of serial correlation and heteroskedasticity. The research empirically reveals a negative long-run relationship between inflation, budget deficits, and economic growth in Sierra Leone for the period being investigated. The research provides key recommendations consistent with findings, among which, is the need for solid policy coordination between the fiscal and monetary authorities in Sierra Leone in order to enhance fiscal discipline through improved revenue mobilisation, adopting inflation-targeting frameworks, and implementing structural reforms to achieve macroeconomic stability and promote sustainable economic growth.

**Keywords:** Inflation, Budget Deficit, Economic Growth, Fiscal Policy, Monetary Policy.

## ARTICLE INFORMATION

Received: 19 February 2026

Accepted: 29 March 2026

Published: 05 April 2026

Cite this article as:

**Brima Kaitibie Lebbie, Saidu Swaray, Abdul Wahab Amara.** An Investigation of the Impact of Inflation and Budget Deficit as Co-Crises on Economic Growth in Sierra Leone. *Open Access Journal of Business and Economics*, 2026; 3(1): 29-43.

<https://doi.org/10.71123/3068-420X.030103>

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## Introduction

Monetary and fiscal authorities around the world are almost in consensus on economic stability and sustainable economic growth as the core objectives of monetary and fiscal policies. Notwithstanding, despite their efforts, they often fall short of delivering on their objectives, resulting in inflationary pressures, increased public

debt, and macroeconomic instability. This has brought to light interest of several researchers and policymakers investigating the impact of inflation and budget deficit on the economic growth of various countries.

Inflation and budget deficit are essentially relevant macroeconomic indicators that influence the economic stability and growth trajectory of developing countries.

For developing countries like Sierra Leone, these macroeconomic indicators have profound implications on overall economic performance. Sierra Leone's economic history has been marked by severe macroeconomic shocks. The average inflation between 1980 and 1990 was 62.9%, which declined to 38.4% between 1991 and 2001. It further declined to 8.6% during the first decade after the end of the civil unrest in 2002. In addition, the country discovered huge deposits of iron ore in 2012, where the country was pronounced as one of the fastest growing economies by the International Monetary Fund, resulting to a 5.5% decline in inflation, further to 4.6% in 2014. Unfortunately, however, the country was hit severely by Ebola Virus (EVD) in 2014, where inflation started increasing, hitting 6.5% in 2015 and reached double digits during the post-EVD era to 15% between 2016 and 2019, and 15.7% between 2020 and 2021 during the Corona Virus Disease (COVID). The high inflation rate exacerbated in 2022, reaching 37.09% because of the lingering effects of the Russia invasion in Ukraine, resulting to persistent increase in the pump price of petroleum products. Following these macroeconomic shocks, the fiscal and monetary authorities embark on major structural reforms aimed at reducing the inflation rate and budget deficit, in order to create a stable macroeconomic environment conducive for sustainable economic growth and development. Despite these efforts, the inflation rate and budget deficit remain a significant problem for policymakers in Sierra Leone, as the reforms have not achieved their intended purposes.

The impact of inflation and budget deficit on economic growth have long been debated by researchers, as different studies have identified the causal relationships, either individually or collectively, which have implications for growth in an economy. A widely accepted view in macroeconomics is that low inflation is essential for economic growth. The popular view is that high interest rates are yielded by large deficits which have chronic effects on both the economic growth and productivity.

There has been differing opinions on how inflation and budget deficit affect economic growth. Swaray et al. (2023), for example, examined the optimal inflation rate for Sierra Leone based on Annual data sets selected from the World Bank, spanning 1980 to 2020. The analysis found two inflation thresholds at 6.8% and 18.2%. Below 6.8%, inflation negatively impacted growth, while between 6.8% and 18.2%, the impact was less pronounced. The study concluded that inflation must be kept within a specific range to avoid harming economic growth in Sierra Leone.

This study, therefore, intends to investigate the impact of inflation and budget deficit on Sierra Leone's economic growth, providing an empirical analysis that inform policy

decisions and promote sustainable economic growth and development.

## The Problem Statement

Over the years, Sierra Leone has experienced several economic challenges characterised by fluctuating inflation rates and persistent budget deficits. These macroeconomic problems have raised concerns about their potential adverse effects on the country's economic growth and development prospects.

The general contention is that inflation has adverse effects on economic growth implying that an increase in inflation will result in a decline in economic growth. This can be augmented by ideas established by Dornbusch and Fischer (1993) which strongly advocates that inflation be contained at all cost and must not be allowed to fluctuate beyond the single digit level.

The structure of Sierra Leone's economy can be described as a budget deficit combined with an increase in inflation rates, which considerably disturb stable economic growth and development. Despite different policy measures adopted by the government of Sierra Leone through Ministry of Finance to reign in the budget deficits and mitigate the volatile prices, Sierra Leone still faces these imbalances with serious concerns over their long run consequences for economic stability and growth.

Sierra Leone has for long been characterised by high budget deficit resulting in difficulty in raising adequate revenue to fund its priority sectors to include education, health, and agriculture. These deficits have often been funded through loans, widening the public debt. The total public debt service for the period January to June in 2024 alone amounted to NLe3.50 billion (about US\$146.75 Million). High inflation reduces purchasing power, creates investment distortions and undermines the confidence of the economy. This mirrors the inflationary trend of Sierra Leone in which inflation increased from 12.9% to 102% between the periods of 1980 to 1991, while economic growth declined from 4.6% to 2.3%. The persistent budget deficit arises from low tax revenue and growing government expenditure. Poor fiscal performance reflected the slow growth in real gross domestic product, except for 15.2% and 20.1% growth 2012 and 2013 respectively. These growths were, however, driven by the iron ore production, which started in 2012.

Monetary, exchange rate, and foreign reserves policies were employed to bring inflation back to single digit and maintain price stability. The central bank of Sierra Leone plays an important role in formulating and implementing monetary policies to regulate money supply, control inflation, and influence interest rates. Despite these

efforts, the policies were largely ineffective. Therefore, it is necessary to investigate the nexus between inflation, budget deficit, and economic growth to guide policymakers in implementing appropriate measures in Sierra Leone.

## Literature Review

### Theoretical Literature

The research reviews four major theories that contribute to understanding of the impact of inflation rate and budget deficit as co-crises on economic growth in Sierra Leone.

#### *Classical Theory*

The classical theory explains that the economy functions efficiently when markets operate freely. Output depends on labor, capital, and technology, while prices and wages adjust to clear markets. Inflation arises when money supply increases faster than real output or when supply shocks raise costs. Within this framework, budget deficits are considered harmful to economic growth. Government borrowing competes with private borrowers for loanable funds, raises interest rates, and discourages investment. Capital accumulation slows and productivity growth weakens. Any short-term stimulus from deficit spending fades as prices adjust, leaving lower long-run output growth driven by reduced investment and higher interest rates.

#### *Keynesian Theory*

The Keynesian theory places aggregate demand at the center of short run output determination. Prices and wages do not adjust immediately to shocks, so when demand falls, production and employment decline rather than prices. Budget deficits raise government spending above tax revenue and stimulate output when private spending is weak. Higher government expenditure increases income, raises consumption, and encourages businesses to expand production. The fiscal multiplier reinforces this effect, so the increase in output becomes larger than the original rise in spending. Inflation arises when demand exceeds available productive capacity. If deficit spending continues at full employment, firms respond to excess demand by raising prices, which lowers purchasing power and weakens confidence. Growth benefits from deficits during recessions because they restore output and employment, but persistent spending at capacity reduces growth prospects by creating inflationary pressure.

#### *Monetary Theory*

Monetary theory views inflation as a result of excessive growth in the money supply relative to output. When too much liquidity circulates in the economy, demand rises faster than supply, and prices increase. Once inflation expectations form, workers and firms incorporate expected

price increases into wage and price decisions, making inflation persistent. Real growth depends on capital, labor, and technology, not on money supply expansion. The effect of budget deficits is tied to how they are financed. A deficit financed through money creation expands the money supply and pushes up inflation. A deficit financed through borrowing increases the demand for loanable funds, which pushes interest rates upward. Firms reduce borrowing and investment, slowing capital accumulation and long run productivity. In this approach, the pathway from deficit to weaker growth operates through money growth and inflation when the deficit is monetised or through higher interest rates and reduced investment when the deficit is financed by borrowing.

#### *Modern Monetary Theory*

Modern Monetary Theory argues that a government that issues its own currency and operates under a floating exchange rate does not face a financial limit to spending. Government expenditure injects money into the economy and taxation withdraws it. A budget deficit becomes a source of net financial assets for the private sector. When there are unused resources such as unemployed labor and idle production capacity, deficit spending increases output and employment without generating inflation. Inflation appears only when total spending exceeds available productive capacity. Once the economy reaches its resource limit, further deficit spending pushes demand beyond supply and forces prices upward. For this reason, fiscal contraction through taxation or reduced spending is recommended when inflation pressures surface. Growth improves when deficits target productive sectors such as infrastructure, agriculture, and education, because these investments expand future productive capacity and support higher employment and income. The movement from deficit spending to growth therefore flows through increased employment, strengthened private savings, higher demand, and enhanced productive capacity, with inflation arising only when resource constraints bind.

#### **Empirical Literature**

In academia, no work is conducted independently; rather, research builds upon existing studies, contributing to the ever-expanding body of literatures. Several studies have been conducted by different researchers to analyse the impact of inflation and budget deficit on growth. Various researchers used their designed models to find the relationship between inflation and budget deficit and the resultant effect on growth.

Barrie and Jackson (2024) investigated the effects of fiscal dominance on macroeconomic performance in Sierra Leone using a Dynamic Stochastic General Equilibrium (DSGE) model. Their simulation showed that monetary financing

of fiscal deficits crowds out private investment, reduces growth, and weakens government revenue capacity. The study found that persistent reliance on domestic borrowing leads to a debt spiral and deteriorates macroeconomic stability. Key macroeconomic indicators such as output, inflation, interest rates, and employment were negatively affected under fiscal dominance. The authors recommend strengthening fiscal discipline, expanding the domestic revenue base, and limiting central bank financing in line with statutory provisions to safeguard macroeconomic stability.

Daba et al. (2025) examined the impact of fiscal deficits on economic growth in 42 Sub-Saharan African countries using annual panel data from 2011 to 2021. Employing a two-step System GMM estimation, the study found that fiscal deficits positively affect growth in the short run but negatively in the long run. Specifically, a 1% increase in the deficit boosts short-term growth by 0.036%, while reducing long-term growth by 0.013%. The study also identified gross fixed capital formation and real interest rates as significant drivers of growth, recommending that Sub Sharan African countries reduce fiscal deficits and prioritize capital investment to sustain long-term economic performance.

Duodu et al. (2022) examined the long-run relationship between money supply, budget deficit, and inflation in Ghana using quarterly data from 1999 to 2019. Employing a Vector Error Correction Model (VECM), Granger causality tests, and impulse response functions, they found that budget deficits significantly increase inflation, while money supply surprisingly reduces it. Inflation, in turn, positively affects budget deficits and negatively affects money supply. The weak exogeneity test supports the Fiscal Theory of the Price Level, highlighting the dominant role of fiscal policy in Ghana's inflation dynamics.

Swaray et al. (2023) investigated the threshold effect of inflation on economic growth in Sierra Leone using annual data from 1980 to 2020. Employing a non-linear regression model with an endogenous threshold approach, they identified two inflation thresholds 6.8% and 18.2%. Their findings revealed that inflation negatively affects growth below both thresholds, with a stronger adverse impact below 6.8%. Above 18.2%, inflation showed no significant effect on growth. The study concludes that maintaining inflation within the 6.8% to 18.2% range is optimal for promoting economic growth in Sierra Leone.

Gülcemal (2024) examined the dynamic relationship between inflation, economic growth, and budget deficits in Turkey using annual data from 1990 to 2022. Applying econometric techniques including Granger causality and variance decomposition, the study identified a

unidirectional causality from economic growth to inflation, and from inflation to budget deficits. This suggests that growth drives inflation, which in turn contributes to fiscal imbalance. The findings underscore the importance of coordinated macroeconomic policies aimed at stabilizing inflation to support growth and fiscal sustainability.

Ahmed (2020) paper decomposes the relationship between inflation and economic growth in a multi-country scenario and estimates their impact. The model is estimated using cointegration and error correction model (ECM) and uses annual data series collected from the world bank covering 10 different countries. The study found that the relationship between inflation and economic growth varies by country, with some showing a positive correlation and others a negative one. Additionally, most of the empirical studies conducted in the 1990s, also found a negative relationship between inflation and economic growth.

Bah et al. (2023) investigated the effects of money supply and inflation on economic growth in Sierra Leone using annual data from 2000 to 2020. Employing regression analysis, the study found a positive but statistically insignificant relationship between broad money growth and GDP per capita growth, while inflation measured by the GDP deflator had a significant negative impact on growth. The findings suggest that inflation undermines economic performance, whereas monetary expansion does not yield meaningful growth effects. The authors recommend diversifying economic strategies and strengthening monetary policy coordination to mitigate inflationary pressures and support long-term growth.

Issie (2023) examined the influence of inflation on economic growth to determine the extent to which the fight against inflation can contribute to the economic growth of a country or a regional zone such as the Economic and monetary community of central Africa (CEMAC). He employed a multiple linear regression model and used panel data from 2000-2018. They study found a positive relationship between inflation and economic growth.

Mensah and Opoku (2023) examined the effects of budget deficits on economic growth in Ghana. Using data spanning from 2000 to 2022, and employing a Dynamic Ordinary Least Squares (DOLS) method, they concluded that budget deficits hampered growth, with inflation exacerbating the effects. They stressed the importance of prudent fiscal policies.

Similarly, Akinleye and Ekpo (2019) investigated the relationship between inflation, budget deficit, and economic growth in Nigeria, using data from 1980 to 2016. Applying the ARDL Bounds Testing approach, they found that inflation had a negative but significant effect on economic growth both in the short and long run. The

results also indicated that budget deficits had a strong negative influence on economic growth, primarily due to government mismanagement of resources, creating a policy argument for fiscal discipline.

### Methodology

This research utilises a quantitative research design to analyse the impact of inflation rate and budget deficit on economic growth in Sierra Leone. The research employs a time series data collected over several years ranging between 1990 and 2024.

### Model Specification and Description of Variables

The primary model to find out the relationship among the Economic Growth (RGDP) and, Inflation Rate (INF); Budget Deficit (BD); Real Exchange Rate (RER); Real Interest Rate (RIR); Foreign Direct Investment (FDI), and war dummy variable (D) can be represented in a functional form as;

$$RGDP = f(INF, BD, RER, RIR, FDI, D) \quad (1)$$

Where:

RGDP is dependent on the explanatory variables (INF, BD, RER, RIR, FDI, D)

In econometric form, it can be represented as;

$$RGDP_t = \beta_1 INF_t + \beta_2 BD_t + \beta_3 RER_t + \beta_4 RIR_t + \beta_5 FDI_t + \epsilon_t \quad (2)$$

Where:

RGDP<sub>t</sub> is the dependent variable, representing Real Gross Domestic Product (Economic Growth Rate). INF<sub>t</sub> and BD<sub>t</sub> are the key explanatory variables of interest, representing Inflation Rate and Budget Deficit as a percentage of GDP respectively, RER<sub>t</sub> is an explanatory variable, representing

the Real Exchange Rate of the Leone currency against other currency, RIR<sub>t</sub> is an explanatory variable, representing the real interest rate, FDI is an explanatory variable, representing Foreign Direct Investment, and D is the war dummy variable that takes the value of one (1) for war period and zero elsewhere.  $\alpha$  is the intercept term.  $\beta_1, \beta_2, \beta_3, \beta_4,$  and  $\beta_5$  are coefficients for the explanatory variables, representing the estimated impact of a unit change in each variable on the Real Gross Domestic Product.  $\gamma$  is the coefficient of the dummy variable, and  $\epsilon_t$  is the error term, which is independently and identically distributed with mean zero and constant variance one, ie,  $\epsilon_t$ .

### Estimation Procedure

In analyse the long run and short run relationship between inflation and budget deficit on growth, as well as the dynamic interactions among other variables of interest, we first analyse the time series characteristics of the dataset to establish the unit root properties of the variables by employing the Augmented Dickey Fuller (ADF) test to check stationarity of variables or otherwise make them stationary by taking the first difference of the variables. We then proceed to the Autoregressive Distributed Lag (ARDL) cointegration procedure developed by Pesaran, et al. (1997) in order ascertain whether there is long-run association among RGDP, INF, BD, RER, RIR, FDI, and D. The Error Correction Model (ECM) is also estimated to check stability of the long-run association among the variables.

We take the logarithms of the variables, such that:

$$\ln(RGDP_t) = \alpha + \beta_1 \ln(INF_t) + \beta_2 \ln(BD_t) + \beta_3 \ln(RER_t) + \beta_4 \ln(RIR_t) + \beta_5 \ln(FDI_t) + \gamma D + \epsilon_t \quad (3)$$

The specified ARDL model is:

$$\ln(RGDP)_t = \alpha + \sum_{i=1}^p \phi_i \ln(GDP)_{t-i} + \sum_{j=0}^{q1} \beta_{1j} \ln(INF)_{t-j} + \sum_{k=0}^{q2} \beta_{2k} \ln(BD)_{t-k} + \sum_{l=0}^{q3} \beta_{3l} \ln(RER)_{t-l} + \sum_{m=0}^{q4} \beta_{4m} \ln(RIR)_{t-m} + \sum_{n=0}^{q5} \beta_{5n} \ln(FDI)_{t-n} + \gamma_1 D + \epsilon_t \quad (4)$$

Where:

ln(RGDP) is the dependent or vector variable, ln(INF) and ln(BD) are key explanatory variables, ln(RER), ln(RIR), ln(FDI) are all control variables,  $\beta$ 's and  $\alpha$  are the parameters. P is the lag order for the dependent variable and q1, q2, q3, q4 and q5 are the lag orders for the independent variables to be determined by model selection criteria (AIC, BIC).

### The Autoregressive Distributed Lag Technique

The study uses the Autoregressive Distributed Lag (ARDL) Bounds testing approach developed by Pesaran, et al. (1997). Estimating an ARDL model involves four steps. First, we examine the presence of co-integration using the bounds test procedure (Pesaran, et al. (1997). Second,

we estimate the coefficient of the long run relationships identified. Third, we estimate the short run coefficients. Finally, we test for model stability, by using the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squared recursive residuals (CUSUMSQ).

ARDL is chosen over other approaches like Engle, et al. (1987), Phillips and Perron. (1988), Johansen and Juselius (1990) because it identifies the co-integrating vector(s) directly. Each variable represents a separate long run relationship equation. If there exists a co-integrating vector, the ARDL model is reparameterised into Error Correction Model (ECM). The reparametrised result yields short-run dynamics and long-run relationships of variables of a single model.

The ARDL approach also considers sufficient lags to capture the data-generating process from general to specific.

Therefore, we can specify the long-run ARDL model as:

$$\Delta(RGDP)_t = \alpha + \sum_{i=1}^p \phi_i \Delta(GDP)_{t-i} + \sum_{j=0}^{q1} \beta_{1j} \Delta(INF)_{t-j} + \sum_{k=0}^{q2} \beta_{2k} \Delta(BD)_{t-k} + \sum_{l=0}^{q3} \beta_{3l} \Delta(RER)_{t-l} + \sum_{m=0}^{q4} \beta_{4m} \Delta(RIR)_{t-m} + \sum_{n=0}^{q5} \beta_{5n} \Delta(FDI)_{t-n} + \gamma_1 D + \epsilon_t \quad (5)$$

The ARDL model testing procedure starts with conducting the bound test, which states the null hypothesis of zero cointegration, that is:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$

Against the alternative hypothesis of the existence of cointegration, that is:

$$H_1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$$

If the computed F-statistic falls outside the critical bound, a conclusive inference can be made without considering the order of integration of the regressors. Also, if the F-statistic is higher than the upper critical bound, the null hypothesis of no cointegration is rejected. Alternatively, if the F-statistic is lower than the lower critical bound, then the null hypothesis of cannot be rejected. If, the F-statistic lies within the lower and upper bounds, then the test is inconclusive. In this case, unit root tests should be conducted to ascertain the order of integration of the

$$\Delta(RGDP)_t = \beta_0 + \sum_{i=1}^{p-1} \phi_i \Delta(GDP)_{t-i} + \sum_{j=0}^{q1-1} \beta_{1j} \Delta(INF)_{t-j} + \sum_{k=0}^{q2-1} \beta_{2k} \Delta(BD)_{t-k} + \sum_{l=0}^{q3-1} \beta_{3l} \Delta(RER)_{t-l} + \sum_{m=0}^{q4-1} \beta_{4m} \Delta(RIR)_{t-m} + \sum_{n=0}^{q5-1} \beta_{5n} \Delta(FDI)_{t-n} + \theta ECM_{t-1} + \mu_t \quad (6)$$

Where:

denotes the first difference, is the Error Correction term representing the long-term equilibrium relationship, is the speed of adjustment coefficient (which is expected to be negative significant)

### Unit Root Test

It is important to test for the statistical characteristics of variables since time series data are rarely stationary in level form. Regression with nonstationary time series often leads to spurious results. Time series is stationary if its mean, variance and auto-covariance are independent of time. The Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) tests are used. The two tests are similar but differ in how they correct for auto-correlation in the residuals. Both tests examine the null hypothesis that a series contains unit root (non-stationary) against the alternative hypothesis of no unit root (stationary).

$$H_0: p = 0 \text{ (} Y_t \text{ is non-stationary).}$$

$$H_1: p \neq 0 \text{ (} Y_t \text{ is Stationary)}$$

### Stability Test

This suggests that the stability of parameters should

This helps address endogeneity and serial correlation in macroeconomic variables.

variables. If all the variables are found to be I (1), the decision is based on the upper critical value. If all the variables are I (0), it is based on the lower critical bound value. Once a cointegrating relationship is established, the error correction estimates of the ARDL model are obtained. The diagnostic test statistics can be examined from the short run estimates at this stage.

### Error Correction Model (ECM)

The ARDL method also facilitates the creation of dynamic Error Correction Model (ECM), which integrates short-run dynamics with long-run equilibrium without losing long-term information. The ECM measures the speed of adjustment, which is expected to be negative and statistically significant to further confirm the existence of a cointegrating relationship. It corrects for disequilibrium in the short-run by adjusting towards long-run equilibrium relationship. The ECM is specified as follows:

be tested using cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) after the model is estimated. This helps remove bias in the results due to unstable parameters. The results show that the CUSUM and CUSUMSQ plots for the estimated ARDL model are within the 5% significance bound. The study's use of this test is important since it supports Hansen's (1992) warning that estimated time series parameters may change over time and model misspecification is possible.

### Robustness and Diagnostic Tests

To ensure the reliability and accuracy of the results from the empirical analysis, the research

conducts a series of diagnostic and robustness tests. These checks are important for confirming

that the model assumptions hold and that the results are not driven by statistical errors or biased

estimations.

### Normality Test

The normality of the data is tested using Jarque-Bera to check whether the data are normally distributed. The null

hypothesis will be rejected if the p-value is less than the 5% significance level. The Jarque-Bera value is 0.44 with a probability of 0.80, both above the 5% significance level, demonstrating that the model is sound.

**Serial Correlation**

The serial correlation in the discrete time case is the correlation of a signal with delayed copy of itself as a function of delay. It is the similarity between observations of a random variable as a function of the time lag between them. This analysis is also a tool for finding repeating patterns, such as the presence of periodic signal obscured by noise, or identifying the missing fundamental frequency in a signal implied by its harmonic frequencies.

**Heteroscedasticity Test**

Breusch Pagan Test was introduced by Trevor Breusch and Adrian Pagan in 1979. It is used to test for heteroscedasticity in a linear regression model and is assumed that the error term is normally distributed. The study conducts heteroscedasticity test to determine whether the variance of the errors from regression is dependent on the values of the independent variables. It is a chi-square test.

**Data Sources**

The research analysis focuses on time series secondary data sourced from the World Bank’s World Development Indicators Database, Statistics Sierra Leone, and the Central Bank of Sierra Leone. These datasets include indicators such as the Consumer Price Index (CPI) for inflation (INF), Budget Deficit (BD) (measured as a percentage of GDP), Real Exchange Rate (ER), Real Interest Rate (RIR), and Foreign Direct Investment (FDI). The data is cleaned, validated, and processed for econometric analysis to ensure reliability, accuracy, and consistency. The use of World Bank’s World Development Indicators ensures a standardized dataset, while the Statistics Sierra Leone and the Central Bank of Sierra Leone complement it with macroeconomic insights and policy-relevant variables for the specified period.

**Presentation and Analysis of Empirical Results**

This section presents the empirical findings and discussion of results. It provides descriptive statistics, unit root test

(at level and first difference), Phillips-Perron (at level and first difference) and the bounds test of cointegration results. The section also provides the long run and short run results, stability and diagnostic analysis.

**Descriptive Statistics**

The results of the descriptive statistics are shown in Table 1. The table depicts the statistical results which helps to understand the underlying conditions under which Sierra Leone’s economy has evolved, especially between 1980 to 2024. According to the results, the dataset reveals that Sierra Leone’s economy has experienced several fluctuations over the decades. The mean of the natural logarithm of Real Gross Domestic Product (lnRGDP) stands at approximately 2.94, which indicates modest levels of economic activity on average. For Inflation (lnINF), the mean of approximately 3.13 exhibits a considerable level of volatility, reaching as high as 5.21 when at its peak. Budget Deficit (lnBD) appears relatively stable with mean of about 4.62 and a low standard deviation of -0.10. The results also show that the natural logarithms of Real Gross Domestic Product, Inflation, Budget Deficit, Real Interest Rate, and Foreign Direct Investment have negative skewness with values of -2.462999, -0.428310, -0.641090, -4.041848, and -3.767139, respectively, indicating that the values are moderately skewed to the left. The Real exchange Rate, however, has a positive skewness of 0.475937, implying that the variable is skewed to the right, and that it is normally distributed with a positive skewness value. The value of the kurtosis for the variables Real Gross Domestic Product, Inflation, Budget Deficit, Real Exchange Rate, Real Interest Rate, and Foreign Direct Investment are all above 3, which indicate that the distributions are platykurtic, i.e., the distributions have a thinner tail shape than a normal distribution. The values of the Jarque-Bera statistic test for the goodness of fit of whether the sample has skewness and kurtosis matching a normal distribution and P-values are less than the 5% significance level for the variables Real Gross Domestic Product, Inflation, Budget Deficit, Real Exchange Rate, Real Interest Rate, and Foreign Direct Investment, which indicate that we cannot reject the null hypothesis, and thus, conclude that they are normally distributed.

**Table 1.** Descriptive statistics

VARIABLES	lnRGDP	lnINF	lnBD	lnRER	lnRIR	lnFDI
Mean	2.937917	3.129687	4.615377	4.961468	3.842923	3.337640
Median	3.216826	3.010128	4.620059	4.808534	4.027012	3.431000
Maximum	3.871537	5.209432	4.855929	6.332537	4.379062	4.127134
Minimum	0.000000	0.000000	4.323603	4.514735	0.000000	0.000000
Std. Dev.	0.855255	0.974290	0.101966	0.475937	0.713323	0.655098

Skewness	-2.462999	-0.428310	-0.641090	0.475937	-4.041848	-3.767139
Kurtosis	8.111047	4.276039	4.021244	4.558239	21.79860	18.14025
Jarque- Bera	90.27897	4.232047	4.814075	23.73150	715.3365	512.4031
Probability	0.00000	0.120510	0.090082	0.000007	0.00000	0.000001
Sum	126.3304	134.5765	198.4612	213.3431	157.5598	143.5185
Sum Sq. Dev.	30.72138	39.86813	0.436678	9.513693	20.35320	18.0244
Observation	45	45	45	45	45	45

Source: Author’s compilation from EViews 12

**Unit Root Test Results**

The results are presented in table 2.

Although the ARDL approach to co-integration doesn’t require prior unit root testing, it’s still important to confirm the order of integration of the variables to ensure that none

is integrated at a higher order. The Augmented Dickey Fuller (ADF) and Phillips Perron (PP) were applied to all variables in both levels and first differences. Lag length selection was based on the schwart-bayesian criterion (SBC) and Akaike Information Criterion (AIC).

**Table 2. Unit Root Test Results**

Variables	Augmented Dickey- Fuller		Phillips Perron		Order of integration
	Level	1st Difference	Level	1st Difference	
lnRGDP	-4.160373	-9.356551	-4.132449	-11.58296	I (0)
lnINF	-2.602150	-8.755952	-2.602150	-9.721156	I (1)
lnBD	-1.841109	-8.525868	-2.460548	-8.997355	I (1)
lnRER	-1.490326	-5.066040	-1.591012	-5.043640	I (1)
lnRIR	-1.845437	-3.110241	-4.194977	-16.48385	I (1)
lnFDI	-4.889234	-10.24256	-4.889234	-12.92460	I (0)

Source: Author’s compilation from EViews 12

The results indicate that most variables are integrated of order one, I(1), except for Real GDP (lnRGDP) and foreign direct investment (lnFDI), which are integrated of order zero, I(0). The variables lnINF, lnBD, lnER, and lnRIR are at level but become stationary after first difference under both tests.

In contrast, lnRGDP and lnFDI are stationary at level without differencing. Overall, the results confirm a mixture of I(0) and I(1) variables, which supports the application of the ARDL framework.

**Table 3. Lag length selection result**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-146.9178	NA	6.99e-05	7.459404	7.710170	7.550719
1	-38.51313	179.7931*	2.09e-06*	3.927470	5.682836*	4.566678*
2	-1.425853	50.65580	2.22e-06	3.874432*	7.134398	5.061532

Source: Eviews 12

Note: (\*) values indicate lag order selected by each criterion.

The selection of a lag length of 2 in our analysis was determined based on the Akaike Information Criterion (AIC) and Final Prediction Error (FPE), which indicated that this was the optimal choice. This decision aligns with the recommendation made by Pesaran and Shin (1999) for annual data, where they also advised using a maximum lag

**Selection of Optimal Lag**

To estimate the ARDL model effectively, it’s essential to decide on the best number of lag periods, which can be determined by evaluating various lag length criteria such as the sequential modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hanna-Quinn information criterion (HQ). These criteria help in identifying the most suitable lag length for your analysis.

length of 2. As a result, the study utilizes two lags for each of the variables, in accordance with these criteria

**ARDL F-Bound Test Cointegration Results**

From the Unit test results in table 2, we perform this test using the ARDL model. To achieve this, the bound’s

testing approach is used to determine whether a long-term relationship exists among the variables. According to the decision rule, the null hypothesis of no co integration is accepted if the calculated F-statistic falls below the lower

bound. If the F statistic exceeds the upper bound critical value, cointegration exists and the null hypothesis is rejected.

**Table 4.** *Bounds Test Result for Co-Integration Analysis*

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	4.688191	10%	1.99	2.94
K	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

**Source:** *Author’s compilation from Eviews 12*

From the results presented F-statistic (4.688191) exceeds the critical values at 1%, 5%, and 10% significance levels. This leads to the rejection of the null hypothesis and confirms the existence of co integration relationship among the variables. Therefore, there exist a long run relationship among the variables.

**ARDL Long run Results.**

The long-run relationship between the dependent variable

and independent variables can be estimated by calculating the co-integrating equations in the ARDL model. Upon estimating the model, the long-run coefficients are obtained by solving for equilibrium level of the variables, where changes in the dependent variable are offset by changes in the independent variables. The long-run results show that all the independent variables are statistically significant in the long-run.

**Table 5.** *Long Run Coefficients*

Variables	Coefficient	Std. Error	t-Statistic	Prob.
ln(INF)	-0.301927	0.103557	-1.040023	0.0013***
ln(BD)	-0.557309	0.951270	-0.585857	0.0002***
ln(RER)	-0.030828	0.148212	-0.207998	0.0012***
ln(RIR)	-0.115296	0.145391	0.793002	0.0200**
ln(FDI)	0.683313	0.234199	2.917665	0.0120***
DUMMY	-0.498427	0.145022	-3.436897	0.0020***
C	5.838027	4.126276	1.414842	0.1690

**Source:** *Author’s compilation from Eviews 12, denotes \*\*\*, \*\* significance at 1% critical value and 5% critical value respectively*

The table shows the long run relationship of the study based on its empirical findings. All independent variables are statistically significant in the long- run. The coefficient for inflation (lnINF) is negative -0.30 and statistically significant at the 5 percent level, suggesting that in the long run, a 1 percent increase in inflation reduces real GDP (lnRGDP) by 3.0 percent.

Inflation reduces purchasing power and raises uncertainty, discouraging investment and production, and negatively impacting economic growth. This is particularly relevant in Sierra Leone, where inflation may stem from supply constraints and external shocks such as changes in global commodity prices.

This result is consistent with the findings of Fischer (1993), who showed that inflation hinders economic growth by eroding consumer purchasing power and reducing firms’ profitability. Barro (1999), similarly noted a negative relationship between inflation and economic

growth, stating that inflation discourages long-term investments due to higher business costs. In Sierra Leone, high inflation reflects macroeconomic instability, which hinders both private sector development and public sector performance.

A negative relationship also exists between budget deficit and growth with statistically significant coefficient at the 5 percent significance level in the long run. A 1 percent increase in the budget deficit reduces growth by 0.56 percent. This aligns with the classical view that fiscal deficits crowd out private investment through higher interest rates and reduces access to credit. This finding is consistent with Easterly and Schmidt-Hebbel (1993), who argue that high deficits reduce available resources for private investment and create inflationary pressures, leading to economic stagnation. Additionally, Aisen and Hauner (2008) found that large fiscal deficits slow down economic growth by destabilising macroeconomic

conditions and increasing debt service costs. In Sierra Leone, persistent budget deficits may have diverted funds from productive investment to debt servicing, contributing to slower growth. This outcome supports Huynh (2007), who also found a negative relationship between budget deficits on growth.

Similarly, the real exchange rate has a negative long run effect on growth with statistically significant coefficient at the 5 percent significance level. The coefficient of -0.03 for the exchange rate (LNER) indicates that a 1 percent depreciation of the local currency is associated with a 0.03 percent decline in economic growth suggesting that exchange rate volatility negatively affects the economy.

Depreciation raises imports cost, increases inflation, and reduces output. This is consistent with Kamin and Rogers (2000), who showed that exchange rate instability can lead to decreased investor confidence and reduced capital inflows. Similarly, Montiel and Jahjah (2003) highlighted the adverse effects of exchange rate fluctuations on developing economies, where depreciation can lead to higher inflation and reduced economic growth. In Sierra Leone, currency depreciation increases the cost of essential imports and constrains growth.

The coefficient of -0.12 for the real interest rate (LNRIR) suggests that a 1 percent increase in real interest rates

reduces economic growth by 0.12 percent and is statistically significant. Higher interest rates discourage consumption and investment. This aligns with the findings of Khan and Senhadji (2001), who found that higher interest rates reduce the capacity of firms to finance expansion and innovation, thereby slowing growth. In Sierra Leone, high real interest rates may have limited private sector access to credit, particularly in agriculture and manufacturing.

Foreign direct investment shows a positive and statistically significant relationship with growth in the long run. A 1 percent increase in FDI increases economic growth by 0.68 percent.

The dummy variable has a negative effect on economic growth during the period of study. A 1 percent increase in the dummy variable decreases output by 0.50 percent reflecting the impact of war on production and supply chains. **Short run Analysis**

After establishing the co-integrating relationship, the VECM was estimated to capture the short-run adjustments to the equilibrium. The error correction results show that, inflation, budget deficit, exchange rate, real interest rate, foreign direct investment, and the lag-variable of real GDP, are statistically significant at the 10% and 5% respectively. The results of the short-run analysis are shown in table 6.

**Table 6.** Short Run Result - Dependent variable (Real GDP growth rate) AIC ARDL (2,2,0,2,0,1,2,1)

Variables	Coefficient	Std. Error	t-statistics	Prob.
D(ln(RGDP) (-1))	-1.076306	0.139636	-7.707956	0.0000***
D(ln(INF))	-0.409433	0.119965	-3.412945	0.0029***
D(ln(BD))	-0.678601	1.071235	-0.633475	0.5340
D(ln(RER))	-0.898313	0.629731	-1.426502	0.1699
D(ln(FDI))	-0.032925	0.126573	-0.260128	0.7976
DUMMY	0.390515	0.249525	1.565038	0.1341
ECT(-1)	-0.478567	0.270412	-4.782849	0.0001***
R-squared	0.918185	Mean dependent Var.	0.100706	
Adjusted R-squared	0.844981	S.D. dependent Var.	0.997718	
S.E. of regression	0.392826	Akaike info	1.275529	
Sum squared resid	2.931926	Schwarz criterion	2.059282	
Log likelihood	-5.598448	Hannan-Quinn criterions.	1.551879	
F-statistics	8.971344	Durbin-Watson stat.	1.988392	
Prob(F-statistics)	0.000001			

**Source:** Author's compilation from Eviews 12

The short-run estimation presented in Table 6 shows the dynamic adjustment of the variables.

The lag of real GDP, D(ln(RGDP) (-1)), is statistically significant with a negative coefficient of -1.08, indicating a negative impact on the Real GDP. This suggests that past economic performance influences the RGDP, with adverse shocks persisting in the short term.

The inflation variable D(ln(INF)) is significant with a negative coefficient of -0.41, implying that inflation reduces GDP in the short run by eroding purchasing power and discouraging investment and consumption.

The budget deficit D(ln(BD)) has a negative coefficient of -0.68, but is statistically insignificant in the short run. The insignificance of this variable might be attributed to the

government’s ability to finance its deficit through short-term borrowing mechanisms, without having an immediate impact on GDP. This aligns with the debt-overhang theory, which suggests that while fiscal imbalances may not exert immediate effects on economic growth, their cumulative impact becomes more pronounced in the long term as debt servicing costs rise and the burden on the economy grows. Nonetheless, the negative sign signals potential crowding-out effects, where government borrowing limits the availability of credit for private sector investments.

The exchange rate,  $D(\ln(RER))$ , has a negative but statistically insignificant coefficient (-0.90), suggesting that depreciation affects GDP, though with mixed short run effects across sectors. Foreign direct investment,  $D(\ln(FDI))$ , also has a negative and statistically insignificant coefficient (-0.03), indicating that the growth effects of FDI take time to materialize through capital formation and productivity gains.

**Table 7.** Serial Correlation Test

F- statistics	1.764365	Prob. F (2, 22)	0.1871
Obs *R-squared	3.960662	Prob chi- square (2)	0.1380

Source: Author’s compilation from Eviews 12

**Heteroskedasticity test (Breusch - Pagan – Godfrey)**

The Breusch-Pagan-Godfrey test result for this model’s heteroskedasticity revealed that the model was homoscedastic because the p-value of 0.50, or around 50%, is higher than the crucial value of 0.05, or 5%. The model’s estimates are stable and reliable, so passing the heteroskedasticity test gives confidence when recommending policies. Regression analysis depends

**Table 8.** Heteroskedasticity test result

F-Statistics	0.906998	Prob. (20,13)	0.5015
Obs *R-squared	15.18491	Prob. Chi-square (20)	0.4627
Scaled Explained SS	2.821292	Prob. Chi- square (20)	0.9733

Source: Author’s compilation from Eviews 12

**Normality Test**

The model passed the normality test based on the fact that the Jarque-Bera value of 0.44 and its probability of 0.80

**Diagnostic Tests**

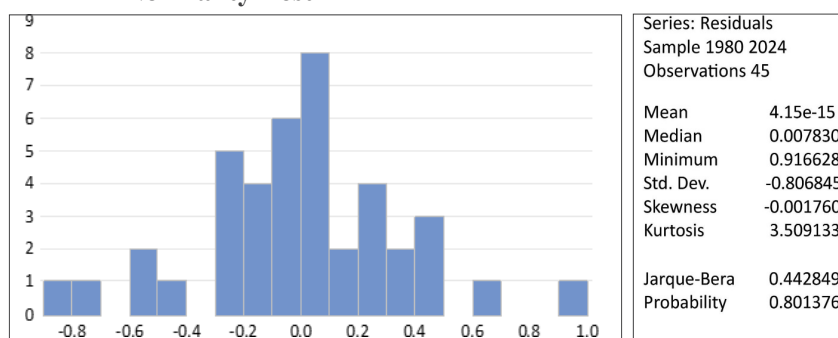
**Serial Correlation**

This test revealed that the model was devoid of serial correlation because it was agreed upon as the null hypothesis that the probability of the coefficient must exceed the usual 5% level of significance. To ascertain the degree of association among economic growth and other identified explanatory variables, the test of serial correlation is established. The study makes use of the Breusch-Godfrey serial correlation LM test for autocorrelation. The probability value of the F-statistics is greater than the required percentage of 5 percent set for no serial correlation; hence the null hypothesis of no serial correlation cannot be rejected. Therefore, this model has no serial correlation

heavily on the heteroskedasticity test’s results, which indicate that the variance of the residuals is constant at all levels of the independent variables. If the heteroskedasticity test is unsuccessful, the model’s predictions may be more accurate for some values of the explanatory variables and less accurate for others, which could skew the results and lessen the policy implications derived from the analysis.

are both more than the 5% level of significance, and this test further demonstrates that the model is sound.

**Normality Test**

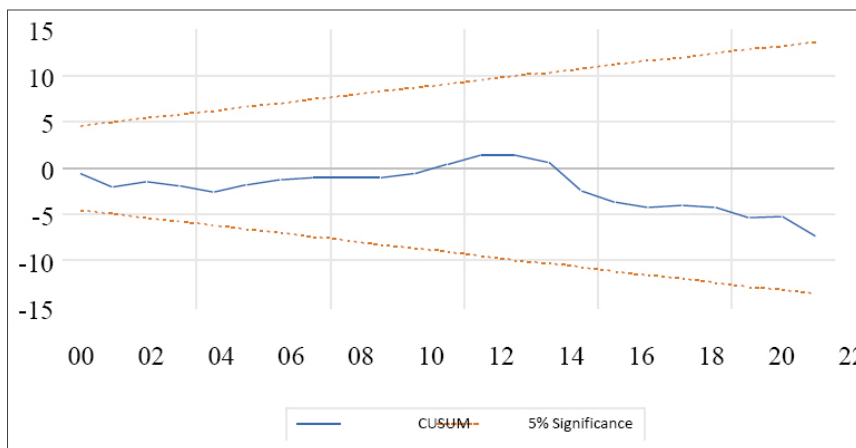


**Stability Test**

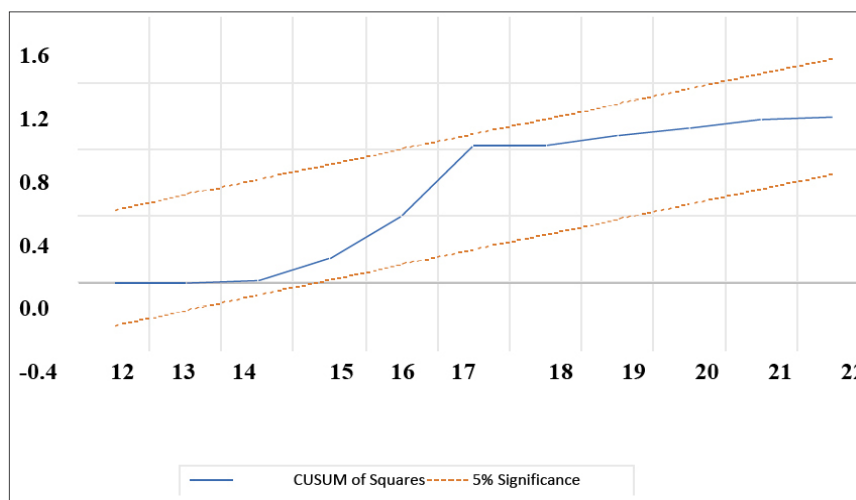
Pesaran and Pesaran (1997) recommend testing for the stability of parameters using cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) after model estimation. This helps to avoid bias arising from unstable parameters. The CUSUM and CUSUMSQ results show that the plots for the estimated ARDL model lie within the 5% significance bounds.

The use of this test also aligns with Hansen’s (1992), who noted that time series parameters may change over time leading to possible model misspecification. A failure in these tests would indicate structural breaks or changes in underlying economic conditions.

Figures 1 and 2 show all coefficient plot remain within the 5% critical bounds, indicating the absence of instability.



**Figure 1.** Plot of CUSUM Test for Stability. Source: Eviews 12



**Figure 2.** Plot of CUSUMQ Test for Stability. Source: Eviews 12

**Summary of Major Findings.**

The relationship between inflation, budget deficits, and economic growth has been a debate for policymakers in Sierra Leone over the past decades. This investigation, endeavored to ascertain the relationship between inflation, budget deficits, and economic growth in Sierra Leone for the period covering 1980 to 2024, revealing how these macroeconomic variables interact and influence the country’s economic performance.

The research reveals a statistically significant long-run relationship between inflation and economic growth. The finding is that high inflation rates have generally had a detrimental effect on Sierra Leone’s economic growth. Colossal inflation erodes the purchasing power of

consumers, and discourages savings and investment, all of which hinder productive economic activities.

The study also establishes a strong link between budget deficits and inflation. Persistent fiscal deficits in Sierra Leone, often financed through the expansion of the money supply, have contributed to rising inflation levels. This relationship depicts the cyclical nature of fiscal and monetary policies, where large deficits lead to increased money creation, which fuels inflation and further destabilises the economy. Consequently, high inflation driven by fiscal indiscipline obstruct sustainable economic growth.

Fiscal imbalances have restricted the government’s ability to invest in vital infrastructure, social services, and

development projects. These deficits divert resources away from productive uses and often necessitate borrowing or money creation, which exacerbates inflationary pressures. As a result, economic growth slows down, and the country faces challenges in achieving long-term development objectives.

The investigation further indicates an inverse relationship between budget deficits and economic growth. Higher deficits tend to correlate with lower growth rates, emphasizing the need for prudent fiscal management. Sierra Leone, however, must prioritise fiscal discipline to avoid excessive deficits that can destabilise the economy.

Apart from Foreign direct investment, which had a positive and significant long run impact on economic growth, both the ARDL long-run and short-run relationships reveal that inflation, budget deficit, real exchange rate, and real interest rate have a negative relationship with economic growth, which implies that, increase in, for instance, inflation, budget deficit, real exchange rate, and real interest rate would necessitate a decrease in economic growth.

Policy implications from these findings include sustainable inflation control and fiscal discipline must be prioritised in fostering stable and inclusive economic growth. More importantly, implementing effective monetary and prudent fiscal policies will curb inflation, reduce deficits, and create a more conducive environment for investment, job creation, and poverty reduction.

Additionally, the study notes that the impact of inflation and budget deficits on Sierra Leone's growth has varied over different periods, often influenced by external shocks such as global economic downturns, commodity price fluctuations, and internal policy reforms.

The investigation underscores the significant negative impact of high inflation and persistent budget deficits on Sierra Leone's economic growth. Addressing these macroeconomic challenges through disciplined fiscal and monetary policies will be very vital for achieving sustainable development and improving the livelihoods of Sierra Leoneans.

### **Policy Recommendations**

In line with the aforementioned findings of this research, several policy measures are essential to mitigate the adverse effects of inflation and budget deficits on Sierra Leone's economic growth. The following proposed recommendations should be considered:

Most importantly, there should be a coherent and coordinated approach between fiscal and monetary authorities to ensure that policies are mutually reinforcing in achieving macroeconomic stability. The Ministry

of Finance or Treasury should strengthen its fiscal discipline by implementing robust fiscal management strategies aimed at reducing budget deficits. This can be achieved through improved revenue mobilisation, efficient expenditure management, and prioritisation of developmental spending over recurrent expenses. On the other hand, the Central Bank of Sierra Leone should adopt targeted monetary policy measures to control inflation. This includes controlling money supply, maintaining interest rates conducive to investment, and strengthening inflation targeting frameworks to promote price stability.

By promoting revenue generation and diversification, the Government of Sierra Leone should reduce reliance on borrowing and diversify its revenue sources by broadening the tax base, improving tax compliance, and exploring alternative revenue streams through the National Revenue Authority (NRA). Also, structural reforms aimed at improving governance, reducing corruption, and enhancing the efficiency of public financial management should be adopted by the Anti-Corruption Commission (ACC) and the Audit Service Sierra Leone (ASSL). These reforms will foster a transparent and accountable fiscal environment conducive to sustainable growth and development.

The country should seek external financial assistance prudently and ensure that borrowing is sustainable. Effective and efficient debt management strategies should be adopted by the Public Debt Division of the Ministry of Finance in addition to prevent debt distress and ensure that borrowed funds are channeled into productive investments rather than for personal use.

There are also mixed implications of foreign direct investment (FDI). Efforts to attract FDI to supplement domestic investment in Sierra Leone should be encouraged. It should be considered that policies to attract FDI need to be constructed with a long-term view to maximise the positive effects of FDI on the country's economy. Policies that aim to attract FDI, at all cost, in the short run will not bring fundamental benefits to the economy. Other than prioritising the attraction of FDI, governments should look into policies on human capital, money supply and total credit for the private sector in order to enhance economic growth and absorb the maximum FDI benefit.

The government should pay critical attention to the real exchange rate. From negative relationship between real exchange rate and growth in the long run, and the short run indicated a positive impact on growth. It is imperative for the government to depreciate its currency so as to improve the level of the economy's export base to outweigh its import base. By this, the economy would experience growth mainly in the short run. Note, this recommendation would yield good fruit if the export base is largely elastic

as opposed to the import base. In the planning phase of the economy (long run), a depreciation of the currency would impact the economy negatively. It is advisable to leave the determination of exchange rate to the forces of demand and supply so as to meet the equilibrium level. Hence, depreciation of the economy's currency to enhance growth in the short run is just for quick fix and has to be abandoned in the long run.

### List of Abbreviation

ACC	Anti-Corruption Commission
ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criteria
ARDL	AutoRegressive Distributed Lag
ASSL	Audit Service Sierra Leone
BD	Budget Deficit
BSL	Bank of Sierra Leone
CPI	Consumer Price Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMQ	Cumulative Sum of Squares of Recursive Residuals
ECT	Error Correction Term
ECM	Error Correction Model
FDI	Foreign Direct Investment
GMM	Generalized Method of Moments
FPE	Final Prediction Error
HQ	Hanna-Quinn information Criterion
IMF	International Monetary Fund
INF	Inflation Rate
MOF	Ministry of Finance
REXR	Real Exchange Rate
RGDP	Real Gross Domestic Product
RIR	Real Interest Rate
LR	Likelihood Ratio Test
MPTC	Monetary Policy Technical Committee
MPTM	Monetary Policy Transmission Mechanism
OLS	Ordinary Least Squares
PP	Phillips Perron
PROB.	Probability
SAP	Structural Adjustment Program
SBC	Schwartz Bayesian Criteria
SC	Schwarz Information Criterion
SME	Small and Medium Enterprises

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