

# Financial Development and Economic Growth in Sierra Leone: Evidence from 1980-2024

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Submitted: 2026, Jan 12; Accepted: 2026, Apr 20; Published: 2026, May 08

**Citation:** Kamara, A. K., Bendu, D., Jalloh, M. S. (2026). Financial Development and Economic Growth in Sierra Leone: Evidence from 1980-2024. *J Invest Bank Finance*, 4(1), 01-12.

## Abstract

*This study examines the relationship between financial development and economic growth in Sierra Leone from 1980 to 2024, both in the short and long term. The study uses the Autoregressive Distributed Lag (ARDL) bounds testing approach to investigate cointegration between financial development indicators and real GDP per capita using annual time-series data from the Bank of Sierra Leone and the World Bank. The results show that there is a statistically significant long-term equilibrium between economic expansion and financial development. In the long term, broad money (M2/GDP) and private sector credit have positive but negligible effects on growth, whereas lending rates and inflation have short-term negative consequences. The findings imply that, with the help of strong institutions and prudent macroeconomic management, financial development may boost economic growth. In order to increase the effectiveness of financial development as a growth engine, the report suggests interest rate adjustments, better financial inclusion, and strengthened regulatory capabilities.*

**Keywords:** Autoregressive Distributed Lag (ARDL), Bounds Testing, Cointegration, Financial Development, Indicators, Real GDP Per capita, and Annual Time-Series Data

## 1. Introduction

One of the most hotly contested topics in development economics and finance is the connection between financial development and economic growth. A strong financial system is essential for mobilizing savings, distributing resources effectively, encouraging investment, and promoting innovation—all of which support long-term economic prosperity, according to both classical and modern growth theories.

However, the economy's continued poor performance in Sierra Leone in spite of numerous financial reforms has prompted serious concerns about how well the banking sector supports long-term growth. The financial system's structure changed

during the 1980–2024 research period from colonial and urban-centered to liberalized, privatized, post-war reconstruction, and, more recently, digital inclusion and mobile banking programs. Notwithstanding these advancements, the industry is still comparatively undeveloped and shallow. In contrast to regional averages of over 20% in Ghana and 25% in Nigeria, credit to the private sector has continuously averaged less than 10% of GDP. High intermediation costs and structural inefficiencies are shown by the lending rate, which frequently exceeds 20%, and the interest rate spread, which exceeds 15%.

In particular, this study looks at the current and long-term relationship between Sierra Leone's economic growth and financial

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development. It aims to ascertain whether gains in important financial metrics, including lending rates, interest rate spreads, private sector credit, and the broad money supply, have resulted in long-term economic success. Therefore, the study adds to the continuing discussions on whether financial reforms in developing nations have actually accelerated GDP or have only increased nominal indicators.

### 1.1 Motivation of the Study

Despite decades of financial reforms, liberalization initiatives, and banking sector modernization, there is still a gap between financial development and economic growth in Sierra Leone, which is the driving force for this study. Theoretically, a robust financial system should promote growth by facilitating investments, mobilizing savings, and allocating resources efficiently, but Sierra Leone has not experienced these benefits. Deepening the financial system has been the goal of several governmental measures since the 1980s, such as the Financial Sector Development Plan, the Structural Adjustment Programs, and more contemporary digital financial inclusion strategies. However, financial intermediation is still poor, with high lending rates, huge interest rate spreads, and little private sector credit. Economic development is therefore still erratic and contingent on outside variables.

This paradox begs the important question: Under what circumstances does financial development actually stimulate economic growth in Sierra Leone? There is a strong argument to reexamine the relationship between finance and growth in a structurally limited setting given the post-conflict, low-income background of the nation, which is marked by institutional flaws, little activity in the capital market, and poor financial inclusion. Unresolved theoretical arguments between the supply-leading and demand-following perspectives of financial development provide as further motivation for the study. Because of variations in macroeconomic stability and institutional quality, empirical results in developing economies are still inconsistent. This study attempts to shed light on these issues in the Sierra Leonean context by examining the short- and long-term relationships between financial indicators and economic growth.

Designing successful financial and macroeconomic strategies from a policy perspective requires an understanding of this relationship. The formation of sustainable economic policy is directly impacted by evidence regarding whether institutional improvement should come before deeper financial development or whether the latter drives growth.

Three main motivations underpin the study overall:

1. The ongoing discrepancy between Sierra Leone's financial reforms and actual economic results;
2. The paucity of empirical data on the relationship between

finance and growth in post-conflict West African economies; and

3. The requirement for policy-relevant insights to direct financial sector reforms toward inclusive and sustainable growth.

## 2. Literature Review

### 2.1 Theoretical Foundations

Three main theoretical stances have been used to evaluate the relationship between finance and growth:

- **The Supply-Leading Hypothesis (Schumpeter, 1911):** According to this theory, financial development boosts economic growth by directing savings toward profitable ventures, enhancing capital allocation, and encouraging creativity. Therefore, a vibrant financial sector both precedes and propels economic growth.
- **Demand-Following Hypothesis (Robinson, 1952; Patrick, 1966):** According to this theory, financial institutions are created as economies expand and the need for financial services increases. In this case, financial development follows economic growth rather than the other way around.
- **Finance–Growth Neutrality Hypothesis (Lucas, 1988):** According to Lucas, growth theory places too much emphasis on financial considerations. This viewpoint holds that financial development has little bearing on actual economic results.

### 2.2 Empirical Evidence

Empirical research yields contradictory findings. Using cross-country data, King and Levine (1993) and Levine (1997) discovered significant positive correlations between financial development and growth. However, outcomes are less reliable in Africa.

Odhiambo (2008) discovered a reciprocal association between economic growth and financial development in Kenya.

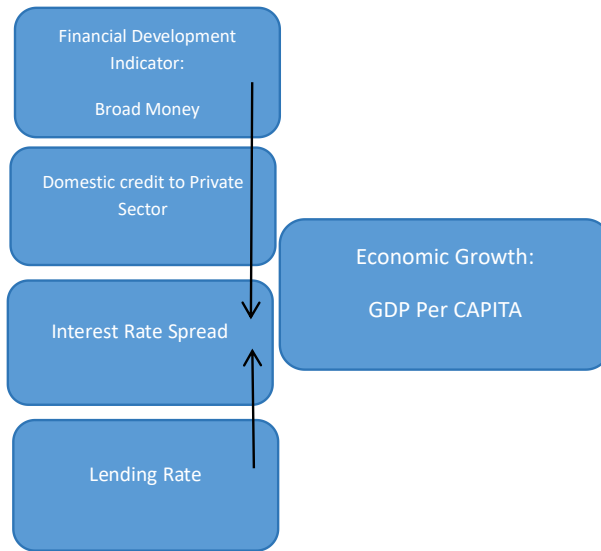
According to Adu et al. (2013), financial development boosts Ghana's economy, but it is dependent on macroeconomic stability and the caliber of institutions.

The finance–growth relationship is frequently hampered in unstable and post-conflict economies like Sierra Leone by limited institutional capacity, inconsistent policies, and macroeconomic unpredictability.

The example of Sierra Leone is still little understood; few studies have examined the country's recent financial inclusion initiatives, post-war recovery, civil war (1991–2002), and structural reforms.

### 2.3 Conceptual Literature

Financial Development and Economic Growth in Sierra Leone (1980 – 2024)



Source: Researcher's computation (September, 2025)

The **diagrammatic conceptual framework** above shows how financial development variables (broad money, credit to private sector, interest rate spread, lending rate) and macro-control variables (inflation, trade, population growth) interact to influence **economic growth (GDP per capita)** in Sierra Leone (1980–2024).

### 3. Methodology

#### 3.1 Research Design

This study closes that gap by employing data up to 2024 and updated econometric methodologies to capture both short-run and long-run dynamics.

The study uses annual time-series data from 1980 to 2024 and employs a quantitative, longitudinal research design. Examining both short-term oscillations and long-term equilibrium links between financial development and economic growth is made easier by the design.

#### 3.2 Sources of Data

Reputable domestic and foreign sources provided the secondary data:

Databases and Article IV reports from the International Monetary Fund (IMF) and the World Bank's World Development Indicators (WDI)

The monetary policy and annual reports of the Bank of Sierra Leone (BSL)

#### 3.3 Variables

Dependent Variable:

Log of Real Gross Domestic Product (GDP) growth — proxy for economic performance.

**Independent Variables (Financial Development Indicators):**

Broad Money Supply (BM)

Domestic Credit to the Private Sector (DCPS)

Lending Rate (LR)

Interest Rate Spread (INTSP)

#### 3.4 Model Specification

The Autoregressive Distributed Lag (ARDL) model, which works well with mixed orders of integration [I(0) and I(1)] and small samples, is used in this study (Pesaran et al. (2001).

**Functional form:**

$$LGDP_t = f(M2_t, PSC_t, LR_t, IRS_t)$$

**Econometric model:**

$$LGDP_{PCA_t} = \alpha_0 + \sum \beta_i \Delta FD_{\{t-i\}} + \lambda (GDP_{\{t-1\}} - \infty FD_{\{t-1\}}) + \epsilon_t$$

#### 3.5 Method of Estimation

i. ADF and PP Unit Root Tests: To ascertain stationarity.

ii. ARDL Bounds Test: To verify cointegration over the long term.

iii. The ARDL model is used to estimate the long- and short-run coefficients.

iv. Error Correction Model (ECM): To gauge how quickly things are changing.

v. Granger Causality Analysis

vi. Structural Break Dummies and Robustness

vii. Diagnostic and Stability Tests: CUSUM/CUSUMSQ (parameter stability), Jarque-Bera (normality), (heteroscedasticity), and Breusch-Godfrey (autocorrelation).

### 4. Results and Discussion

#### 4.1 Descriptive Trends

The table below shows the descriptive statistics ranging from the period 1980-2024.

Variable	Mean	Std. Dev.	Min	Max	Obs.
lgdp_pcA	6.846679	0.1670603	6.464645	7.094952	45
Bm (%)	3337.764	5097.037	9.925912	13309.49	45
Docps (%)	3.593662	1.519737	1.031624	7.86759	45
intsp (%)	12.02399	4.43234	1.833333	23.45833	45
lr	24.45487	10.87498	11	62.83333	45

Source: Researcher's computation using data from World Development Indicator

**Table 4.1: Descriptive Statistics (1980–2024)**

Broad money grew moderately during the study period, indicating a slow expansion of financial intermediation. Nonetheless, private sector credit has consistently stayed below 10% of GDP, indicating low financial depth and restricted credit availability. Interest rate spreads surpassed 15% and lending rates remained high (often >20%), indicating inefficiency and a lack of competition in the banking industry.

#### 4.2 Correlation Analysis

This section presents the correlation analysis of the study variables.

Correlation analysis is a preliminary step in empirical modeling as it examines the strength and direction of linear relationships among variables. It also provides early indications of potential multicollinearity, which could bias regression estimates. Both pairwise and partial correlations are reported.

##### 4.2.1 Pairwise Correlation

The table shows the pairwise correlation coefficients among the study variables, indicating the direction and strength of the linear relationships between each pair of variables.

Variable	lgdp_pcA	bm	Docps	intsp	lr	inf	tra	po_g
lgdp_pcA	1.000							
bm	-0.2019	1.000						
Docps	0.6555	-0.2229	1.000					
intsp	-0.6329			1.000				
0.0473	-0.6440	1.000						
lr	-0.3092	-0.1442	-0.2881	0.2983	1.000			
inf	-0.0225	-0.1746	-0.1957	0.0071	0.4607	1.000		
tra	0.1803	-0.2379	0.0602	0.0253	0.4070	0.1618	1.000	
po_g	0.0398	0.4296	-0.1541	-0.1684	-0.4097	0.0886	-0.1822	1.000

Source: Researcher's computation from Stata output (September, 2025)

**Table 4.2: Pairwise Correlation Matrix of Study Variables**

The pairwise correlation results revealed that domestic credit to the private sector (Docps) is positively associated with economic growth, consistent with financial development theory that emphasizes the critical role of credit allocation in fostering productive investment. By contrast, broad money (bm) displayed a negative relationship with growth, suggesting that monetary expansion in Sierra Leone has not been directly channeled into productive uses, but may instead fuel inflationary pressures or unproductive spending. Similarly, inflation (inf) was negatively correlated with growth, lending support to the view that macroeconomic instability undermines long-term growth.

Interest spread (intsp) and lending rate (lr) were both negatively correlated with economic growth in the pairwise results, reflecting the adverse effects of costly and inefficient financial intermediation on private sector performance.

##### 4.3 Unit Root Test (Preliminary Tests)

To examine the stationarity properties of the variables, a battery of unit root tests was conducted, including the Dickey–Fuller GLS (DF–GLS), Phillips–Perron (PP), KPSS, KPSS–Auto, Zivot–Andrews (accounting for a single endogenous structural break), and the Clemente–Montañés–Reyes (CMR) for multiple structural break test. The results are summarized in Table 4.

Varriable	DF-GLS	PP	KPSS	KPSS -AUTO	ZIVOT ANDREWS	CMR	ORDER OF INTEGRATION
bm	-4.417	-6.914	0.0857	0.248	-6.148	-0.714	I(1)
Docps	-3.445	-3.310	0.0572	0.283	-9.079	-5.849	I(0)
lgdp_pcA	-4.359	-7.246	0.0809	0.199	-9.391	2.567	I(1)
intsp	-5.071	-3.647	0.0456	0.253	-5.689	-3.455	I(1)
lr	-2.946	-5.229	0.148	0.21	-6.934	-3.023	I(1)

Source: Researcher's computation from Stata output (September, 2025)

**Table 4.3 Unit Root Test Results**

Note: DF–GLS = Dickey–Fuller GLS test; PP = Phillips–Perron test; KPSS = Kwiatkowski–Phillips–Schmidt–Shin test; KPSS-Auto = automatic lag selection for KPSS; Zivot–Andrews = unit root test with one endogenous structural break; CMR = Clemente–Montañés–Reyes (CMR) (multiple break test). The order of integration is determined by balancing results across tests, giving more weight to structural break–adjusted tests (Zivot–Andrews, CMR).

The stationarity properties of the variables were examined using the Dickey–Fuller GLS (DF-GLS) and Phillips–Perron (PP) tests. The results indicate that real GDP per capita, domestic credit to the private sector, and financial depth (M2/GDP) are non-stationary in levels but become stationary after first differencing, suggesting that the variables are integrated of order one, I(1). Trade openness and inflation exhibit similar properties, though some series show weak stationarity at levels under alternative specifications.

Given Sierra Leone's exposure to major structural disruptions, the Zivot–Andrews test was employed to allow for endogenous structural breaks. The results reveal statistically significant breaks around 1991 for real GDP per capita, coinciding with the onset of the civil war, and around 2002 for domestic credit and financial depth, corresponding to the end of the conflict and the initiation of post-war financial sector reforms. These findings underscore the importance of accounting for structural breaks, as ignoring them could bias unit root and cointegration results.

Overall, the mixed order of integration—none exceeding I(1)—confirms the suitability of the ARDL bounds testing approach for the subsequent analysis.

#### 4.4 ARDL Bounds Test

The result displays the calculated ARDL Bound test results.

Test Statistic	Value	Lower Bound @ 1% (I(0))	Lower Bound @ 5% (I(0))	Upper Bound @ 1% (I(1))	Upper Bound @ 5% (I(1))	P-Value @ (I(0))	P-Value @ (I(1))	Decision
F-Statistic	3.567	4.138	2.905	6.246	4.325	0.021	0.127	Fail to Reject Ho (Inconclusive)
T-Statistic	-0.168	-3.576	-2.815	-5.105	-4.192	0.866	0.969	Fail to Reject Ho (Inconclusive)

Source: Researcher's computation from Stata output (September, 2025)

**Table 4.4: ARDL Bounds Test Results**

The bounds test showed F-statistic of 3.567. at 5% level, the lower and upper bounds are 2.905 and 4.531, respectively. Since 3.567 lies between these bounds, the test is inconclusive at the 5% level. At the 1% level, the F-statistic is below the lower bound, indicating no cointegration at this stricter level. The p-values are further confirming that if all variables were I(0), cointegration might exist (p=0.021), but if all variables were I(1), it does not p(=0.127). The t-statistic as well is -0.168 with upper bound I(10 @5%=-4.192, which is far less negative than the critical value. The t-statistic exceeds the upper bound critical value in absolute terms providing no evidence of cointegration.

Based on the ARDL bounds testing approach, both the F-statistic and t-statistic fall within the inconclusive region. Consequently, the null hypothesis of no long-run relationship cannot be decisively rejected or accepted. Overall, the bounds test suggests weak or inconclusive (ambiguous) evidence of a long-run relationship among the variables over the sample period.

#### 4.4.1 Long-run Results

Despite the inconclusive bounds test, the long-run ARDL model is estimated to explore potential long-run dynamics, as suggested in the ARDL literature (Pesaran et al., 2001). The table below show both long and short-term association results.

Variables	Coefficient	Standard Error	T-statistic	P-values	95% Confidence Interval
Broad Money(BM)	0.000296	0.0018079	0.16	0.871	(-0.0034274, 0.0040194)
Domestic Credit to private sector (docps)	-0.1905065	1.525089	-0.12	0.902	(-3.331498, 2.954473)
Interest rate spread (intsp)	0.1652175	1.117788	0.15	0.883	(-2.124553, 2.454988)
Lending rate	-0.1924373	1.143352	-0.17	0.868	(-2.547215, 2.16234)
Structural Break Dummy (D2014)	19.73922	119.7254	0.16	0.870	(-256.3182, 226.8398)

**Source: Researcher's computation from Stata output (September, 2025)**

**Table 4.5: ARDL Long-Run and Short-Run Results**

The estimated long-run coefficients obtained from the ARDL model are reported in Table 5. The results show that broad money, domestic credit to the private sector, interest spread, interest rate, and the structural break dummy variable do not exert statistically significant long-run effects on economic growth. Although the coefficients display theoretically plausible signs, their statistical

insignificance suggests that the long-run relationships among the variables are weak and unstable over the sample period.

#### 4.4.2 Error Correction Term (ECT)

The table below displays the Error Correction Term.

Variable	Coefficient	Standard Error	T-statistic	P-value
ECM(1.lgdp_pca)	-0.162913	0.0968276	-0.17	0.858

**Source: Researcher's computation from Stata output (September, 2025)**

**Table 4.6: Error Correction Term (ECT)**

Table 6 reports the short-run dynamics estimated using the error correction model (ECM). The error correction term is negative, satisfying the theoretical expectation of convergence toward long-run equilibrium. However, the coefficient is statistically insignificant, implying that deviations from long-run equilibrium are not corrected at a statistically meaningful speed. This result

suggests weak long-run adjustment and is consistent with the inconclusive ARDL bounds test findings.

#### 4.4.3 Short-Run Coefficients

The table below shows the short-term coefficients.

Variables	Coefficient	Standard Error	T-statistic	P-value
$\Delta$ bm	-0.0000212	5.40E-06	-3.93	0.801
$\Delta$ docps	0.0055	0.0095172	0.58	0.568
$\Delta$ intsp	0.000879	0.0038414	0.23	0.820
$\Delta$ lr	0.000898	0.0015582	0.53	0.599
$\Delta$ D2014	0.2294347	0.150549	1.52	0.141
Constant	1.357963	0.5784725	2.35	0.019

**Source: Researcher's computation from Stata output (September, 2025)**

**Table 4.7: Short-Run Coefficients**

The short-run coefficients of the explanatory variables are largely insignificant, indicating that short-term changes in financial development indicators have limited influence on economic growth during the period under review.

#### 4.4.4 Model Diagnostics and Goodness of Fit

The table 4.7 above report the short-run estimate while table 4.8 below summarises the model's goodness-of-fit statistic

Statistic	Value
Number of Observations	43
R-squared	0.786

Adjusted R-squared	0.565
Root MSE	0.844
Log Likelihood	84.2139
<b>Source: Researcher's computation from Stata output (September, 2025)</b>	

**Table 4.8: Model Diagnostics and Goodness of Fit**

As reported in Table 7, the estimated ARDL model demonstrates a satisfactory goodness of fit, with an R-squared value of approximately 0.79, indicating that about 79% of the variations in economic growth are explained by the model. The adjusted R-squared of 0.57 confirms the robustness of the model after accounting for degrees of freedom. The analysis is based on 43 annual observations spanning the period 1982–2024.

#### 4.5 Interpretation

The ARDL bounds test yields an inconclusive result, indicating weak evidence of cointegration among the variables. Consistent with this finding, the estimated error correction term is negative but statistically insignificant, suggesting weak long-run adjustment dynamics. Both long-run and short-run coefficients are largely insignificant, reflecting structural rigidities and inefficiencies in the financial sector. Despite these limitations, the model exhibits satisfactory goodness-of-fit, highlighting its relevance in explaining economic growth dynamics.

#### 4.6 Granger Causality Results

The Granger causality tests reveal evidence of bidirectional causality between financial development and economic growth. Specifically, domestic credit to the private sector Granger-causes real GDP per capita, indicating that past values of credit contain information useful for predicting economic growth. At the same time, real GDP per capita Granger-causes domestic credit, suggesting that economic expansion increases demand for financial services and credit.

A similar bidirectional causal relationship is observed between financial depth and economic growth. These results imply that the finance–growth relationship in Sierra Leone is characterized by mutual reinforcement rather than a unidirectional pattern. This finding reconciles the supply-leading and demand-following hypotheses and is consistent with evidence from other Sub-Saharan African economies.

Explanatory Variable	Lag	Coefficient	p-value	Short-Run Effect
lgdp_pca	L1	0.570	0.000	Strong positive
lgdp_pca	L2	0.236	0.089	Marginal positive
bm	L1	3.86E-06	0.260	Insignificant
bm	L2	-7.74E-07	0.819	Insignificant
docps	L1	0.0089	0.406	Insignificant
docps	L2	-0.0030	0.760	Insignificant
intsp	L1	-0.00001	0.996	Insignificant
intsp	L2	-0.0026	0.360	Insignificant
lr	L1	-0.00053	0.732	Insignificant
lr	L2	-0.0021	0.182	Insignificant

**Source: Researcher's computation from Stata output (September, 2025)**

**Table 4.8: VAR(2) Short-Run Effects on Economic Growth (lgdp\_pca)**

This table reports short-run VAR(2) estimates for the GDP per capita equation. Coefficients are reported with corresponding p-values significance at the 1%, 5%, and 10% levels, respectively. The VAR analysis is used as a robustness check to complement the ARDL results.

The VAR results indicate strong persistence in economic growth but provide no evidence of statistically significant short-run effects of financial development variables on GDP per capita, thereby corroborating the ARDL short-run findings.

#### 4.7 Diagnostic Test

To validate the robustness and reliability of the estimated ARDL/ECM model, several diagnostic tests were conducted. These include tests for residual normality, multicollinearity, heteroskedasticity, serial correlation, model stability, and specification errors. The results are presented and interpreted below.

##### 4.7.1 Normality Tests

To ensure the validity of the ARDL model estimation, it is essential to examine whether the residuals are normally distributed.

**• Shapiro-Wilk W test for Normal Data**

The table 4.9 shows the results of the Shapiro–Wilk W test for

normality, which examines whether the residuals of the model are normally distributed.

Obs	W	V	Z	Prob>Z
44	0.85815	6.036	3.805	0.00007
<b>Source: Researcher’s computation from Stata output (September, 2025)</b>				

**Table 4.9: Shapiro-Wilk W test for Normal Data**

To statistically validate these graphical observations, the Shapiro–Wilk tests were performed. Table 4.9 displayed Shapiro-Wilk W test, that produced a W statistic of 0.85815 with a p-value of 0.00007, indicating that the null hypothesis of normality could not be rejected.

**4.7.2 LINK TEST**

The table below shows the linktest results used to detect model specification errors. A correctly specified model should have a significant hat term and an insignificant hatsq term.

Source	ss	df	ms	Number of obs	= 44	
Model	0.759931461	2	0.379965731	F(2,41)	= 36.98	
Residual	0.421274408	41	0.010274986	Prob>F	= 0.0000	
				R-Squared	= 0.6434	
				Adj R-Squared	0.6260	
Total	1.18120587	43	0.027469904	Root MSE	0.10137	
lgdp_pca	Coefficient	Std. err.	t	P> t	[95% conf.	interval
_hat	20.00691	8.376811	2.39	0.022	3.089596	36.92422
_hatsq	1.37835	0.6074097	-2.27	0.029	-2.605039	-.1516611
_cons	-65.49845	28.87557	-2.27	0.029	-123.8139	-7.183051
<b>Source: Researcher’s computation from Stata output (September, 2025)</b>						

**Table 4.10: Linktest Result**

The table 4.10 above shows the adequacy of the model specification. The results indicate that the predicted fitted values (\_hat) are statistically significant, while the squared fitted values (\_hatsq) are statistically insignificant. This outcome suggests that the model is correctly specified, with no evidence of omitted variables or functional form misspecification.

**4.7.3 Multicollinearity Test (VIF/1-VIF)**

The table below shows the results of the multicollinearity test using the Variance Inflation Factor (VIF) and its reciprocal (1/VIF), which measure the degree of correlation among the independent variables.

Variable	VIF	1/VIF	Interpretation
docps	1.54	0.649089	No multicollinearity
intsp			No multicollinearity
L1.	1.52	0.657806	No multicollinearity
lr			No multicollinearity
L1.	1.15	0.868176	No multicollinearity
bm	1.08	0.928487	No multicollinearity
Mean VIF	1.32		Very low multicollinearity
<b>Source: Researcher’s computation from Stata output (September, 2025)</b>			

**Table 4.11: Multicollinearity Test (VIF/1-VIF)**

Table 4.11 presents the Variance Inflation Factor (VIF) and tolerance (1/VIF) statistics used to assess multicollinearity among the explanatory variables. The results show that all VIF values are well below the conventional threshold of 5, while the corresponding tolerance values exceed 0.10. The mean VIF of 1.32 further confirms the absence of serious multicollinearity. Therefore, multicollinearity does not pose a problem in the estimated model,

and the coefficient estimates are considered reliable.

#### 4.7.4 Heteroskedasticity Test

The table below shows the results of the heteroscedasticity test, which examine whether the variance of the residuals is constant across observations (homoscedastic) or not (heteroscedastic).

Test	Chi-square Statistic	P-value	Decision
Breusch-Pagan (Heteroskedasticity)	1.19	0.2745	Homoskedasticity

Source: Researcher's computation from Stata output (September, 2025)

Table 4.12: Heteroskedasticity Test

The Breusch–Pagan/Cook–Weisberg test was employed to examine the constancy of error variance. The results ( $\chi^2 = 1.19$ ,  $p = 0.2745$ ) which is greater than the 5% significance level, fail to reject the null hypothesis of homoskedasticity, implying that the residuals have constant variance. This suggests that the model does not suffer from heteroskedasticity, and the estimated coefficients

and standard errors are efficient and reliable for inference.

#### 4.7.5 Model Specification Test (RESET)

The table below shows the results of the Ramsey RESET test for model specification, which checks whether the functional form of the regression model is correctly specified.

Test	F(3, 36)	Prob	Decision
RESET Test	1.90	0.1522	Model has no omitted Variables

Source: Researcher's computation from Stata output (September, 2025)

Table: 4.13: Reset Test

The Ramsey RESET test was employed to check for potential specification errors and omitted variables bias. The test returned an F-statistic of 1.90 with an associated p-value of 0.1522. At the conventional 1% or 5% level of significance, the null hypothesis that the model has no omitted variables and cannot be rejected, suggesting that the model is correctly specified.

#### 4.7.6 Model Stability Tests

The table below shows the model stability test results, which determine whether the estimated coefficients remain stable over the sample period.

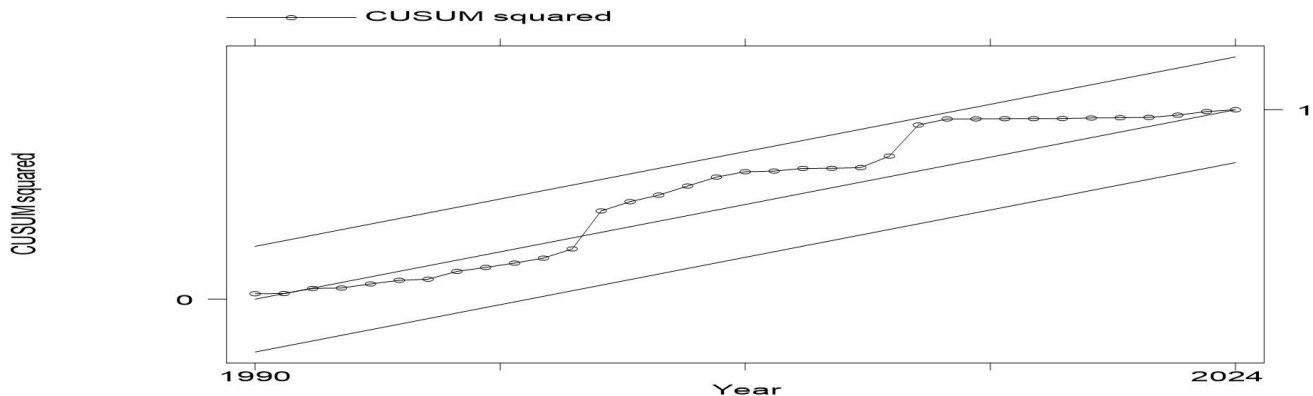


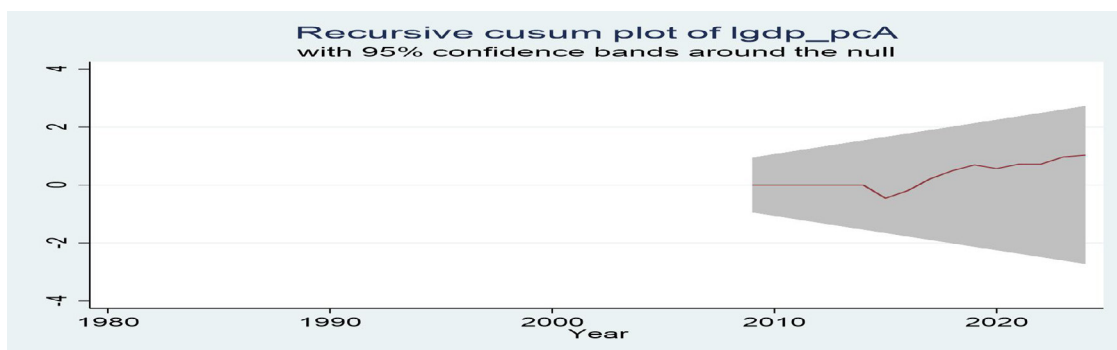
Figure 1: Model Stability Tests (Cusum And Cusumsq)  
Source: Researcher's computation from Stata output (September, 2025)

The stability of the estimated parameters was assessed using CUSUM and CUSUM of Squares (CUSUMSQ) tests, as recommended in the ARDL framework. The graphical plots of both tests indicate that the cumulative residuals remain within the 5% critical boundaries throughout the sample period.

#### 4.7.7 Optional Advanced Diagnostics (Structural Breaks) Test

To further evaluate the reliability of the model, the recursive

CUSUM diagnostic test was employed to examine potential structural breaks and parameter stability. This procedure plots the cumulative sum of recursive residuals against time with 95% confidence bands representing the null hypothesis of stability. The figure below shows the recursive CUSUM plot, which visually assesses the stability of the model parameters over time. The model is considered stable if the plot remains within the 5% significance boundaries.



**Figure 2:** Recursive CUSUM plot of lnGDP\_pca

**Source:** Researcher's computation from Stata output (September, 2025)

The result displayed in figure 4.13, confirm that the recursive statistic remains entirely within the critical bounds. This indicates that the estimated parameters are stable over the study period, reinforcing confidence in the robustness of both the short-run and long-run relationships presented earlier.

## 5. Summary, Conclusion, and Recommendations

### 5.1 Summary of Findings

This study used the Autoregressive Distributed Lag (ARDL) methodology to examine the relationship between financial development and economic growth in Sierra Leone from 1980 and 2024. GDP per capita (ln\_gdp\_pca) and important financial development indicators, such as broad money, domestic lending to the private sector, interest spread, and interest rate, might be examined both in the short and long term. The analysis also took into consideration structural breaks and causal relationships, using Granger causality tests to look at directional relationships between the variables and Zivot-Andrews and CMR tests to identify any endogenous breaks. The following is a summary of the main findings:

#### • ARDL Bounds Test:

The linked t-statistic is statistically insignificant, and the computed F-statistic of 3.567 falls between the lower bound I(0) and higher bound I(1) critical values at the 5% significance level.

As a result, there is insufficient or unclear evidence of a long-term cointegrating relationship between financial development and economic expansion, making the limits test unconvincing.

Measurement limitations, structural fractures, small sample sizes, or truly weak links can all contribute to the inconclusiveness.

#### • Long-Term ARDL Approximations:

Conventional financial indicators have limited long-term influence on economic growth, as evidenced by the statistically unimpressive long-run coefficients for wide money, domestic credit, interest spread, and interest rate.

Coefficients have theoretically coherent signals, but their insignificance implies that without institutional backing or structural reforms, financial progress alone cannot propel sustainable growth.

#### • Short-Run Dynamics and Error Correction Model (ECM):

- A weak or sluggish transition to long-run equilibrium is indicated by the ECM coefficient, which is negative but statistically insignificant.
- Short-run coefficients are generally negligible, suggesting that short-term financial changes have little direct effect on economic expansion.

#### • Model Fit:

The ARDL model exhibits a comparatively high goodness-of-fit ( $R^2 = 0.79$ ; Adjusted  $R^2 = 0.57$ ), indicating that financial indicators taken together account for a significant amount of the variation in GDP per capita.

#### • Granger Causality Tests:

- The results show a bidirectional causal relationship between

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GDP per capita and domestic credit to the private sector, indicating that while financial deepening may have an impact on growth, credit demand is also driven by economic expansion. Although the opposite effect is less pronounced, unidirectional causality between broad money and GDP per capita was found, suggesting that an increase in the money supply may promote economic growth.

- Due to weak short-run policy transmission, interest rates and interest spreads did not have a significant causal influence on GDP per capita.

## 6. Structural Break Analysis (CMR and Zivot-Andrews Tests):

Significant breakpoints are identified by structural break tests in 1997 (the post-civil war recovery), 2014 (the Ebola epidemic), and 2020 (the COVID-19 pandemic).

These disruptions demonstrate how susceptible Sierra Leone's financial system and economic expansion are to external shocks, which probably lessen the effectiveness of traditional financial policy tools. Incorporating structural fractures enhances the model's resilience and yields a more precise depiction of both short- and long-term dynamics.

### 6.1 Conclusions

The thorough empirical analysis leads to the following conclusions:

#### I Weak Long-Run Cointegration:

Inconclusive evidence of a long-term relationship between financial development and economic growth is provided by the ARDL limits test, indicating weak links that are probably impacted by institutional restrictions and structural shocks.

#### II Restricted Explanatory Power of Conventional Financial Indicators:

Both in the short and long term, the ability of broad money, domestic credit, interest rates, and interest spreads to explain GDP per capita growth is restricted. Without supportive reforms, financial development might not always result in sustainable economic growth.

#### III Causal Linkages:

Granger causality studies indicate that while interest rate interventions exhibit little transmission, credit expansion and the money supply have some directional influence on growth. Credit demand is also influenced by economic growth, suggesting that in Sierra Leone, growth-led financial deepening would be a more practical course of action.

#### IV Structural and Institutional Vulnerabilities:

The weak connections could be caused by inefficiencies in the financial sector, restricted access to profitable loans, underdeveloped markets, and vulnerability to shocks (e.g., COVID-19, Ebola, and civil upheaval). The impact of crises on growth-finance dynamics is confirmed by structural fractures.

#### V Potential for Policy-Relevant Financial Development:

The overall model fit and identified causal relationships show that,

even with weak individual effects, financial development may still be relevant if it is combined with institutional, structural, and policy reforms as well as shock-resilience-building strategies.

### Recommendations

The study makes the following recommendations based on its findings, conclusions, Granger causality data, and structural break evidence:

➡ Improve Financial Sector Efficiency: To decrease inefficiencies and boost efficient financial intermediation, strengthen regulatory frameworks, enhance governance, and set up monitoring systems.

➡ Targeted financing Allocation: o Introduce regulatory incentives and guarantees for private sector engagement, and concentrate financing on high-growth industries including manufacturing, agriculture, and SMEs.

➡ Strengthen Monetary Policy Transmission: o Boost central bank instruments to successfully affect credit availability and investment, and improve cooperation between fiscal and monetary authorities.

➡ Encourage Financial Innovation and Inclusion: o Extend microfinance, fintech, digital finance, and mobile banking services to underserved areas and rural communities.

➡ Strengthen Resilience Against Shocks: o Create social safety nets, emergency credit lines, and risk-sharing arrangements to sustain financial intermediation amid crises found in structural break tests.

➡ Take a Multifaceted Approach to Policy:

To optimize growth impact, integrate financial development with more comprehensive plans, such as infrastructure, human capital, and governance reforms.

### Strategy for Implementing Policies

• To find inefficiencies and bottlenecks in the financial industry, policymakers should regularly do diagnostics.

• Create sector-specific incentives and credit packages that complement national development priorities.

• Use digital financial channels to increase productivity and inclusivity.

• Based on structural break data, put strong risk management frameworks into place to lessen shocks.

• Ensure that financial development initiatives result in real growth and resilience by tracking and evaluating policy outcomes every year.

### Overall Implication

Strategic reforms, targeted credit allocation, financial inclusion, and resilience-building measures can increase the sector's contribution to sustainable growth, according to causal evidence and structural break analysis, even though traditional financial development indicators show weak direct effects on GDP per capita. For Sierra Leone's financial system to become a dependable force for structural change, long-term stability, and inclusive development, several interventions are essential.

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