# CREDIT CREATION BY COMMERCIAL BANKS AND ECONOMIC GROWTH IN SIERRA LEONE (1992-2022) AN AUTOREGRESSIVE DISTRIBUTED LAG TECHNIQUE

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**Abstract:**
The study examined the nexus between credit creation and economic growth by commercial banks in Sierra Leone's for the period 1992 to 2022. Specifically, it focused on the influence of commercial bank lending on private sector growth and development. Variables such as interest rate, real exchange rate and inflation are used as independent variables. Gross Domestic Product (GDP) was the chosen metric to represent economic growth, serving as the dependent variable. To ensure uniformity in data analysis, all variables were logged. The study employed the Autoregressive Distributed Lag (ARDL) technique as the primary analytical model. The findings of the regression analysis revealed a direct and positive impact of commercial bank lending on Sierra Leone's economic growth. However, it is noteworthy that the study identified inflation and interest rates as factors exerting negative effects on economic growth.

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## 1. Introduction

Wicksell (2015) opines that lending had a close effect on economic growth within the context of interest rates. If the interest rates are below the rate of return on capital, entrepreneurs would borrow at the money rate to purchase capital goods which would spur a higher economic growth rate. Conversely, if the interest rates are above the rate of return on capital, entrepreneurs would sell the capital goods and hold money in effect reducing economic growth. The government of Sierra Leone has encouraged lending from banks to private investors to boost economic growth in Sierra Leone. Cracknell (2016) argues that facilitating financial access provides impetus to the strengthening of the financial sector which is a key player in economic growth and development. Sierra Leone seems to have borrowed this argument and increased access of Sierra Leoneans to more financial facilities from banks to drive economic growth. However, there seems to be no automatically positive relationship between bank credit and economic growth.

On the Sierra Leone scene, the study of credit and economic growth has focused on public debt. Capital is usually mobilized from either the personal savings of entrepreneurs and/or a loan from banks which make bank loans relevant to the economic growth of countries. Research findings have revealed that bank loans can be a causal factor for economic growth. For instance, Bayoumi and Meanders (2017) note a 2.5% reduction in overall credit causes a reduction in the level of GDP by around 1.5%. This finding is supported by Dementriadis and Hussein (2015) who found out in their study of 13 countries that there is a causal relationship between bank loans and economic growth, but argued that the causality is time and country-bound specific rather than general.

In Sierra Leone, there is detailed information about Sierra Leone's banking industry and its activities, but not too sufficient about how bank loans specifically affect economic growth (Oluitan, 2016). The research used a regression analysis in which the dependent variable was the growth rate of real GDP while the independent variables were domestic debt to nominal GDP ratio and other macroeconomic variables like government expenditure, private sector credit, broad money supply (M3), secondary school enrolment and trade. The study indicated a positive relationship between domestic debt and economic growth in Sierra Leone. Therefore, this study seeks to estimate the impact of commercial banks' lending on economic growth in Sierra Leone from 1992-2022.

## 2. Literature Review

According to Osman (2014), in Saudi Arabian the influence of bank lending on economic growth was studied using an Autoregressive Distributive Approach (ARDL). A yearly time series of data was analyzed using time series analysis, with GDP as the dependent variable and private sector credit (bank lending), government expenditure, commercial bank deposits, inflation rate and trade openness as independent variables. The variables were shown to have a long-term association, and the results of the estimation showed that private sector credit and economic growth were positively related, whereas commercial bank deposits, inflation, and trade openness were all adversely related.

Azeez and Ojo (2012) in Nigeria used an Error Correction Mechanism to examine the impact of Nigeria's banking sector reforms on the country's economic growth from 1986 to 2010. An economic growth model was constructed using five variables: the dependent variable was GDP; the independent variables were interest rate margin, bank lending (proxied by credit to the private sector), savings and inflation. The estimation showed that bank lending and savings were all negatively correlated with growth, while inflation was positively correlated.

Ojeaga *et al.* (2013) in Nigeria used quantile regression estimation to examine the influence of commercial bank lending on the economic growth of Nigerian banks from 1989 to 2012. There were four regressors in this equation: GDP (the regressor), deposit growth (a proxy for loan growth), loan lending from the commercial banks to the private sector (apex of commercial bank monetary policy), interest rates, and money supply. Economic growth was found to be negatively correlated with bank lending, interest rates, and deposits, whereas bank losses and money supply were found to be positively associated with GDP.

Fenta (2012) in Ethiopia using Granger causality with VECM methods, as well as impulse response and variance decomposition conducted a study with selected Ethiopian banks. These banks were linked in a study using quarterly data from 1998 to 2010 which had 52 observations. The variables employed were real gross domestic product, domestic credit, private sector credit, and public sector credit, all in the natural logarithm form variables. The study found out that Economic growth and bank credit have a long-term causal relationship. According to a study by Hashim (2014) in Nigeria, bank lending in Nigeria has a significant impact on economic growth. He used multiple regression models and SPSS to analyze secondary annual data from 1987 to 2012 using bank lending and total bank deposits (a proxy for financial intermediaries) as independent variables that used real GDP to indicate economic growth. The study shows a negative and insignificant association between bank lending and economic growth in Nigeria, whereas there was a positive and substantial relationship between total bank deposits and economic growth.

Bank lending to the private sector and economic growth in Pakistan were explored by Tahir *et al.* (2015) using a VECM from 1973 to 2013. Bank loans to the private sector, interest rates, inflation, investment to GDP, and government consumption were all taken

into account as independent variables in the study of economic growth. Pakistan's economic growth was negatively impacted by bank credit, according to a regression study. Investing as a percentage of GDP and government consumption, on the other hand, had a favorable impact on growth.

Cappiello (2012) in Europe using a panel approach for the European region, employed Log changes in real GDP, log changes in loans, and money demand shocks in his study. Panel regressions with 100 observations were included in the model. Quantitative data were collected on a quarterly basis from the beginning of the European Monetary Union in 1999 Q1 until the end of 2008 Q1. The study found out that changes in the availability of credit, both in terms of volume and credit standards enforced on loans to businesses have a major impact on real economic activity. Murty *et al.* (2012) in Ethiopia conducted a study that looked into how bank loan to the private sector affects long-term economic growth. The findings demonstrated a link between Ethiopia's rapid expansion in bank lending and the country's economy. Variables such as bank credit to GDP, deposit liabilities to GDP ratio, gross secondary school enrolment, the consumer price index, government consumption and openness to international trade were regressed using the vector autoregressive model.

Financial development and economic growth in Nigeria between 1970 and 2010 were studied by Abubakar and Gani (2013) using a VECM model. Other financial development variables considered in the study were commercial banks' liquid liabilities, credit to the private sector, interest rate spread, and government spending. Liquid liabilities of commercial banks were found to have a strong positive impact on economic growth over the long term, while credit to the private sector (bank lending), interest rate spreads and government spending had a major negative impact on Nigeria's growth.

In their study, Okafor *et al.* (2016) in Nigeria, found out that between 1981 and 2014, deposit money bank credit had a direct correlation with Nigeria's economic growth. Granger causality testing with a VAR model was used for the investigation. Using as a dependent variable economic growth was measured using real gross domestic product (GDP), while private sector credit (bank credit) and wide money supply were also tested for their validity using a validity test of serial autocorrelation. The results show that private sector credit and broad money supply had a one-way causal relationship with economic growth, but that real GDP did not affect either credit or money supply. This therefore shows that the Nigerian Central Bank and the Federal Ministry of Finance should take steps to guarantee that the financial system is not just healthy but efficient as well.

Using selected variables such as real gross domestic product, credit to the private sector, interest rate, total deposits and interest rate from the Central Bank Nigeria statistical bulletin, Ozor (2010) in Nigeria examined the impact of commercial bank loans on Economic growth in Nigeria. The study adopted the framework of the Autoregressive Distributed Lag Model for analysis. The results of this study were analyzed using economic, a priori criteria, statistical criteria and econometric criteria. The findings analyzed in the empirical result of the aggregate model revealed that interest rate has a

positive and significant impact on Economic growth indicating that interest rate contributed to Economic growth in Nigeria. Financial deepening has a positive and significant impact on Economic growth implying that financial deepening contributes to Economic growth in Nigeria. Total deposit and credit to the private sector have positive and insignificant impacts on economic growth implying that these variables do not impact economic growth in Nigeria. The study recommends that the Central Bank of Nigeria should deregulate interest rates to make funds available for investors to expand their businesses, increase productivity and boost the economy in the end (Okon, Asidok Nsikhe).

Evans Okisai (2023) examined the significance of lending rates in stimulating real output within the economy over the period under study. The main objective of the study was to assess the effect of lending interest rates on economic growth in Kenya. The study adopted an explanatory research design that is quantitative. The study used a vector error correction model. It was discovered that there were unit roots at levels that became stationary after the first difference. All the assumptions of linear regression were tested and the data was found to follow a normal distribution, with no collinear relationship among the independent variables, data was homoscedastic and also no serial correlation was found. Results showed that lending rates had long-run effects on economic growth. Specifically, lending interest rates ($\beta$=-0.063, $p<0.05$) have a negative and significant long-run relationship with economic growth in Kenya. The study concludes the Central Bank of Kenya may instil sound fiscal and monetary policies for regulating lending interest rates in curbing the level of inflation and money supply in the economy, hence generating economic growth.

## 2.1 Conceptual Framework

The conceptual framework is a diagrammatic representation of how the relationship between the explanatory variables and the dependent variable will be.

Figure 2.1 below shows the conceptual framework.

**Figure 2.1:** Conceptual framework



Explanatory variable

Dependent variable

Bank Lending (+)

Inflation (-)

Interest Rate (-)

Economic Growth (GDP)
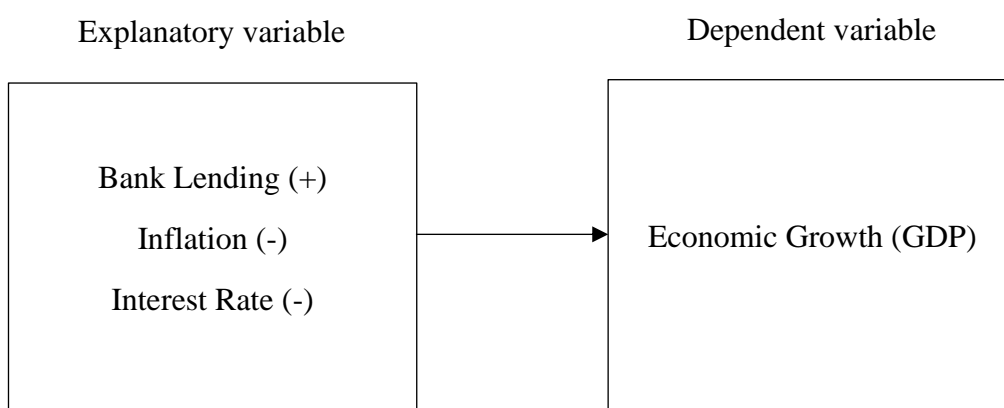
Making reference to Figure 2.1 it is expected that commercial bank lending will result in positive growth whereas inflation and foreign interest rates will negatively influence economic growth once the regressions are done.

## 3. Research Methodology

### 3.1 Research Design
A qualitative design consisting of an econometric model using time series data between 1992 and 2022 was used. A set of econometrics procedures and tests was applied using EViews 12 software.

These tests are: time series analysis procedures, unit root test of variables, cointegration tests, lag order selection, VAR model estimation, VECM procedures, Wald Test, diagnostic tests and the Granger causality test.

### 3.2 Model Specification
The model equation is given as follows:

$$Gdp = f\,(RIR, DCPS, INF, RER) \qquad\qquad (1)$$

$$Log(GDP_t) = \beta_0 + \beta_1 LogRIR_t + \beta_2 LogDCPS_t + \beta_3 LogINF_t + \beta_4 LogRER_t + \varepsilon_t \qquad (2)$$

Where:
Log (RGDP) is the natural logarithm of the real GDP,
Log (RIR) is the natural logarithm of the real interest rate,
Log (DCPS) is the natural logarithm of the domestic credit to the private sector,
Log (INF) is the natural logarithm of the inflation rate, and
Log (RER) is the natural logarithm of the real exchange rate.

Also, we will test the hypothesis of a causal relationship between both private and public bank loans and GDP. The models will be as follows:

$$Log(RGDP_t) = \beta_0 + \beta_1 LogRIR_t + \beta_2 LogDCPS_t + \beta_3 LogINF_t + \beta_4 LogRER_t + \varepsilon_t \qquad (3)$$

### 3.3 Sampling Technique
To estimate the relationship between macroeconomic indicators and bank lending performance in Sierra Leone, the study adopted the Autoregressive Distributed Lag (ARDL) model. To carry out this estimation procedure, the study first analyzed the time series characteristics of the dataset to establish the unit root properties of the variables.

### 3.3.1 Unit Root Test
It is very important to test for the statistical characteristics of variables in the model since time series data are scarcely stationary in level forms. Regression involving non-stationary time series often leads to the problem of spurious regression. Time series is

said to be stationary if its mean, variance and auto-covariance are independent of time.

Because of this, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used. These two tests are similar but different with respect to the way they correct for autocorrelation in the residuals. The PP and the ADF test the null hypothesis that a series contains a unit root (non-stationary) against the alternative hypothesis of no unit root (stationary). That is,

$H_0$: p = 0 (Yt is non-stationary);
$H_0$: p ≠ 0 (Yt is stationary).

### 3.3.2 The ARDL Cointegration Technique and Bound Testing Procedures

The autoregressive distributed lag (ARDL) Cointegration Test, otherwise known as Bound Test which was developed by Parasan *et al.*, (2001) is adopted in this study to test for the cointegration relationships among variables in the model regardless of whether the variables under consideration are I (0) or I (1) or a combination of both. This approach includes lagged values of the dependent variables as well as current and lagged values of explanatory variables.

In addition, the ARDL is chosen instead of other cointegration procedures like Phillips and Hansen (1990), Johansen and Juselius (1990) and Engle and Granger (1987) because it helps in identifying the cointegration vector (s). Specifically, each of the variables in the model stands as a single long-run relationship equation. If there exists a cointegrating vector, the ARDL model of the cointegrating vector is re-parameterized into the error correction model (ECM). The re-parameterized result yields short-run dynamics and long-run relationships of variables of a single model. This parameterization is possible since the ARDL is a dynamic single model and of the same form as the error correction model (ECM).

Furthermore, the rationale for the choice of the above approach is centred on the fact that the ARDL cointegration technique has been proven to be more efficient for small sample data sizes as in the case of this study. The current study uses annual time series data covering a period from 1992 to 2022. Thus, the data points are 30 which is comparatively small. The time series analysis of the impact of bank lending on economic growth in Sierra Leone will pursue the technique of cointegration, which will be employed to estimate the long-run determinant of bank lending; escorted by an error correction model (ECM) which provides accurate estimates for the short-run and the adjustment term once cointegration is found to exist.

Moreover, the ARDL approach to cointegration takes into account a sufficient number of lags to capture the data-generating process from a general to a specific modelling framework. The approach solves the problem of endogeneity and serial correlation in macroeconomic variables with the help of the appropriate number of lags. Therefore, the long-run ARDL model for the growth rate of export in Sierra Leone can therefore, be specified from equation (2) above as:

$$\Delta \ln GDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\Delta \ln RIR_{t-1} + \sum_{i=1}^{p} \alpha_{2i}\Delta \ln DCPS_{t-1} + \sum_{i=1}^{p} \alpha_{3i}\Delta \ln INF_{t-1} + \sum_{i=1}^{p} \alpha_{4i}\Delta r_{-1} +$$
$$\sum_{i=1}^{p} \alpha_{5i}\Delta \ln INV_{t-1} + \beta_1 LnRIR_{t-1} + \beta_2 LnDCPS_{t-1} + \beta_3 LnINF_{t-1} + \beta_4 LnINV_{t-1} + \mu_t$$

(4)

Where $\Delta$ is the difference operator, $\alpha0$ is the constant term $\beta_i$ and $\alpha_i$ are the long–run and the short-run elasticities, respectively, and p is the optimal lag length. i = 1, 2,3…

To trace the existence of cointegration, the F-statistic is computed from the ARDL regression of equation (4). The null hypothesis of no cointegration will also be tested by restricting the lagged level variables equal to (i.e. $H_0 = \beta_{1=} \beta_{2=} \beta_{3=} \beta_{4=} \beta_5 = 0$) against the alternative that $H_1 = \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$. The bounds tests will provide two asymptotic critical value bounds. The lower bound assumes variables are I (0) whilst the upper bounds assumes I (1) variables hypothesis of no cointegration is rejected if the computed F-statistic is greater than the upper critical value bound; otherwise, the null hypothesis is not rejected. Once the cointegrating relationship is ascertained, the error correction estimates of the ARDL model are obtained. The diagnostic test statistics of the selected ARDL model are examined from the short-run estimates at this stage of the estimation procedure.

Similarly, the test for parameter stability of the model can be performed. The error correction representation of equation (4) is specified as follows:

$$\Delta \ln RGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\Delta \ln RGDP_{t-1} + \sum_{i=1}^{p} \alpha_{2i}\Delta \ln RIR_{t-1} + \sum_{i=1}^{p} \alpha_{3i}\Delta \ln DCPS_{t-1} +$$
$$\sum_{i=1}^{p} \alpha_{4i}\Delta \ln INV_{t-1} + \delta ECM_{t-1} + \mu_t$$

(5)

Where $\alpha_i$ represents the short-run coefficients and $\delta$ is the speed of adjustment parameter or feedback effect which is expected to be negative and significant. $ECMt-1$ is the cointegration residual lagged one period obtained from equation (5).

### 3.3.3 Choice of Lag Length
The optimal number of lags is selected using model selection criteria such as the Akaike Information Criteria (AIC), the Schwartz Bayesian Criteria (SBC), the Hannan-Quinn Criteria (HQC) and the general-to-specific sequential Likelihood Ratio test (LR) a small-sample correction to that test (SLR).

### 3.4 Diagnostic Tests
In order to ensure the goodness of fit of the model, the study conducted diagnostic and stability tests. The diagnostic test examines the serial correlation, functional form, normality and heteroscedasticity associated with the selected model. This technique is also known as cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ). The CUSUM and CUSIMSQ statistics are updated recursively and plotted against the breakpoints. If the plots of CUSUM and CUSUMSQ statistics stay within the critical

bounds of a 5 percent level of significance, then the null hypothesis of stable coefficient in the given regression cannot be rejected.

## 4. Results

### 4.2 Descriptive Statistics

This section briefly discusses the basic statistical properties of the relevant variables of the study. Table 4.1 presents the descriptive statistics of the variables. From Table 4.1, it is evident that all the variables have positive average values (mean). It can also be seen that domestic credit (DCPS), INF, and log Real Exchange Rate (RER) are positively skewed, implying that the majority of the values are less than their means. On the other hand, real interest rate (RIR), and real GDP are negatively skewed implying that the majority of the values are greater than their means.

**Table 4.1:** Descriptive Statistics Result

| Variables | RGDP | RIR | DCPS | INF | RER |
|---|---|---|---|---|---|
| Mean | 3.019670 | 6.183596 | 0.780064 | 17.45772 | 115.3637 |
| Median | 4.104700 | 7.995973 | 0.005882 | 12.82645 | 111.9213 |
| Maximum | 26.52413 | 27.16974 | 3.402814 | 82.02358 | 142.8374 |
| Minimum | -20.49107 | -31.6974 | 0.001545 | -3.93416 | 91.35220 |
| Std. Dev. | 9.268649 | 12.45381 | 1.256537 | 18.03995 | 16.16722 |
| Skewness | -0.239342 | -1.33710 | 1.049045 | 2.334123 | 0.328902 |
| Kurtosis | 4.706684 | 5.454971 | 2.265930 | 8.575300 | 1.820750 |
| Observations | 31 | 31 | 31 | 31 | 31 |

**Source:** Eviews 12 output.

### 4.3 Correlation Matrix

In order to address the problem of multicollinearity in the model, the research estimates a correlation matrix to determine the extent of correlation among the variables. Correlation explains the magnitude to which a change in one variable alters the other. If there is a correlation among two variables that is above 70%, then there is a multicollinearity in the model. However, Table 4.2 shows that the model is free from multicollinearity because the highest value of correlation is 61.8% between the consumer price index (CPI) a proxy of inflation and domestic credit to the private sector (DCPS). Thus, the result shows a negative relationship between real GDP and Real interest rate and inflation, whilst a positive relationship is found to exist between export and the other independent variables.

**Table 4.2:** Correlation Matrix

| Variables | RGDP | RIR | DCPS | INF | RER |
|---|---|---|---|---|---|
| RGDP | 1.0000 | | | | |
| RIR | -0.03551 | 1.0000 | | | |
| DCPS | -0.43282 | -0.31796 | 1.0000 | | |
| INF | -0.61846 | -0.18771 | 0.386856 | 1.0000 | |
| RER | 0.25767 | 0.001613 | 0.418434 | 0.116054 | 1.0000 |

**Source:** Eviews 12 output.

## 4.4 Stationarity Test

Although the bound test Autoregressive Distributed Lag (ARDL) approach to cointegration does not require the pretesting of the variables for unit roots. It is important to conduct this test to confirm the order of integration of the variables. Hence, in order to ensure that some variables are not integrated at higher order, there is a need to complement the estimated process with unit root tests. In view of this, prior to applying the (ARDL) approach to cointegration, unit root tests were conducted in order to investigate the stationarity properties of the data. Therefore, the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests were applied to all variables in levels and in the first difference in order to determine their order of integration and confirm stationarity. The maximum lag length used was determined based on the lag selection by the Schwartz-Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC).

The results of both Augmented Dickey-Fuller and Philips Perron for unit root with intercept only in the model for all variables are presented in Table 4.3.

**Table 4.3:** Stationarity Test Results

| Variables | Augmented Dickey-Fuller | | Phillips Perron | | Order of Integration |
|---|---|---|---|---|---|
| | Level | 1st difference | Level | 1st difference | |
| RGDP | -5.380247 | -8.757001 | -5.401575 | -18.82975 | I (0) |
| RIR | -7.643529 | -8.87998 | -8.477006 | -13.90262 | I (0) |
| DCPS | -1.744122 | -5.768157 | -1.748716 | -5.752398 | I (1) |
| INF | -7.424967 | -4.368060 | -7.506858 | -10.62082 | I (0) |
| RER | -2.391296 | -5.683138 | --2.266078 | -5.694164 | I (1) |

**Note:** 5 percent level of significance, with critical value = -2.9411
**Source:** Eviews 11 output.

From the unit root test results in Table 4.3, it found that two of the variables are integrated of order one I (1), which is non-stationary, except RGDP, RIR and INF which are I (0), which is stationary at levels. The decision rule states that we accept the null hypothesis if the absolute critical value at a 5% level of significance is greater than the absolute t-statistic value.

From Table 4.3, it is clear that the corresponding critical values at level for each of the I (0) variables are greater than the t-statistic values, hence we accept the null hypothesis at level and conclude that the variables are non-stationary. But at first difference, the corresponding critical value at 5% is less than the t-statistic values of these variables, and we therefore reject the null hypothesis and accept the alternative hypothesis, and conclude that DCPS, and REER are stationary at first differencing for both ADF and PP tests, which shows that these variables are integrated order one I (1).

Similarly, the corresponding critical values for RGDP, RIR and INF are less than the t-statistic value. Hence, we reject the null hypothesis and conclude that these variables are stationary in levels, i.e. they are integrated of order zero I (0). Since the unit root test results above confirmed the absence of I (2) variables, the ARDL framework is used for estimation.

## 4.5 Lag Selection

In order to estimate the ARDL model, there is a need to determine the optimal lag length based on the lag length criteria such as sequential modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hanna-Quinn information criterion (HQ) were employed to determine the appropriate lag length.

**Table 4.4:** Lag Length Selection Result

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -477.1793 | NA | 1.90e+08 | 33.25375 | 33.48949 | 33.32758 |
| 1 | -369.0678 | 171.4972* | 635925.6* | 27.52192 | 28.93636* | 27.96490* |
| 2 | -342.5793 | 32.88225 | 679637.3 | 27.41926* | 30.01241 | 28.23141 |

**Source:** Eviews 12 output.

From the result in Table 4.4, a lag length of 1 was chosen as the maximum lag length based on the Akaike Information Criterion (AIC) and Final Prediction Error (FPE). Therefore, this study uses two lags for each of the variables. This is also consistent with Pesaran and Shin (1999) who recommended choosing a maximum lag length of 2 for small sample annual data.

## 4.6 Bound Test for Cointegration Analysis

Fundamentally, the primary objective of this study is to assess the main determinants of export performance in Sierra Leone. Because of this, it is essential to test the existence of long-run relationships among variables within the framework of the bounds-testing approach to cointegration. The decision rule states that the null hypothesis, of no co-integration, must be accepted if the F-statistic is less than the lower bound. However, if the computed F-statistic is less than the lower critical bound, then the test fails to reject the null hypothesis, suggesting that a long-run relationship does not exist. Thus, the results of the ARDL F-bounds test are computed below in Table 4.5.

**Table 4.5:** Bounds Test Cointegration Result

| Test statistic | Value | Signif. | I (0) | I (1) |
|---|---|---|---|---|
| | | Asymptotic: n = 1000 | | |
| F-statistic | 5.611335 | 10% | 2.2 | 3.09 |
| k | 4 | 5% | 2.56 | 3.49 |
| | | 2.5% | 2.88 | 3.87 |
| | | 1% | 3.29 | 4.37 |

**Source:** Eviews 12 output.

Based on the results in Table 4.5, we conclude that the calculated F-statistic 5.611335 is higher than the upper bound critical value at the 5 percent level of significance (3.09). This simply shows that the null hypothesis of no cointegration is rejected at the 5 percent level and that there is indeed a cointegration relationship among the Export and its

determinants. Therefore, the study proceeds to estimate both the long-run and short-run models within the ARDL framework. The long-run result is presented in table 4.6 below.

## 4.7 Long-run Estimation

**Table 4.6:** ARDL Long-run Result

| Variables | Coefficient | Std. Error | t-Statistic | Probability |
|---|---|---|---|---|
| RIR | -0.534868 | 0.637809 | -0.838602 | 0.4294 |
| DCPS | -8.141535 | 2.557618 | -3.183249 | 0.0154 |
| INF | 0.972982 | 0.656770 | 1.481466 | 0.1820 |
| RER | 22.57058 | 30.73809 | 0.734287 | 0.4866 |

**Source:** Eviews 12 output.

The result from the long-run estimates in Table 4.6 reveals that domestic credit to the private sector (DCPS), real interest rate (RIR), inflation (INF), and real exchange rate (REER) are the main long-run determinants of bank lending on economic growth in Sierra Leone. Specifically, the result reveals a negative relationship between real interest rate and economic growth in the long run with a statistically insignificant coefficient at the 5 percent significance level. A decrease in the real interest rate by 1 percent will cause economic growth to improve by approximately 0.5 percent during the study period.

The implication of this result is that there is an inverse relationship between central bank rate and economic growth. The decrease in the central bank rate will lead to a fall in the inter-bank rate which will lead to an increase in credit facilities to investors to boost economic growth. The above result is in line with most studies, including Kin Sibanda (2012) and Apkan (2008) on the interest rate and economic growth relationship. However, Tarawallie (2010) found a positive relationship between real interest rates and economic growth in Sierra Leone.

Similarly, the result also reveals that domestic credit to the private sector has a negative relationship with economic growth and it is statistically significant at the 5% significance level. The result implies that the decrease in the domestic credit rate by 1% would improve the economic growth by 8.2% in the long run. The above result is in line with most studies, including Kin Sibanda (2014) and Agather Chisunga and Chibwe (2020) on domestic credit to the private sector and economic growth relationship. However, Tarawallie (2010) found a positive relationship between real interest rates and economic growth in Sierra Leone. The result further shows that inflation (INF) and real exchange rate (RER) were found to be positive determinants of economic growth in Sierra Leone. A 1 percent increase in inflation (INF) will increase economic growth by 0.9 percent, whilst a 1 percent increase in the real exchange rate will also increase e by 0.3 percent in the long term.

## 4.8 Short-run Estimation

The estimation of the short-run model with the Autoregressive Distributed Lag Model (ARDL) is based on the Akaike Information Criterion (AIC) employed.

**Table 4.7:** Error correction model representation for selected ardl model- ardl (1, 2, 2, 2, 2, 1)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 27.14003 | 33.14252 | 0.818888 | 0.4398 |
| D(RIR) | -2.39469 | 0.753260 | -3.179045 | 0.0155 |
| D(DCPS(-1)) | 0.95004 | 9.509293 | -3.149555 | 0.0162 |
| D(INF(-2)) | -0.216465 | 0.755129 | 2.604559 | 0.0352 |
| D(RER(-1)) | 0.589898 | 0.180809 | 3.262546 | 0.0138 |
| ECT(-1)* | -0.724757 | 0.114687 | -7.173054 | 0.0000 |
| R-squared = 0.934021; Mean dependent var = 4.488713; | | | | |
| Adjusted R-squared = 0.754935; S.D. dependent var = 8.514077; | | | | |
| S.E. of regression = 4.214812; Akaike info criterion = 5.846642; | | | | |
| Sum squared resid = 124.3525; Schwarz criterion = 6.806521; | | | | |
| Log likelihood = -58.92967; Hannan-Quinn criterion = 6.132064; | | | | |
| F-statistic = 5.215488; Durbin-Watson stat = 3.176288; | | | | |
| Prob (F-Statistic) = 0.0000013. | | | | |

**Source:** Eviews 12 output.

From the short-run result, the coefficient of the error correction term ECT (-1) has a negative sign with a statistically significant coefficient at the one percent level. With a coefficient of 0.72, the result indicates that approximately 72 percent of the disequilibrium caused by the previous year's shocks converges back to the long-run equilibrium in the current year. The result indicates a high speed of adjustment to long-run equilibrium.

Based on Table 4.7, it was observed that; the model has a goodness of fit (R-squared) of 0.934021, this means that holding all other factors constant, 93.4% of the changes in economic growth can be explained by commercial bank lending, inflation, real exchange rate and interest rates. As this figure is above 50%, this means the model has a strong goodness of fit. Additionally, the model has a probability value of 0.0000 entailing that it is statistically significant in explaining changes in economic growth.

Commercial bank lending, which was proxied by domestic credit to the private sector had a positive coefficient value of 0.95004 which entails that a one percent increase in commercial bank lending increases economic growth in Sierra Leone by 0.95 percent. This finding is consistent with the prior expectation as prescribed by the Wicksell theory. A similar result was obtained by Fenta (2012) who found a positive relationship between commercial bank lending and economic growth in Ethiopia. Additionally, the commercial bank lending coefficient was statistically significant as it had a probability value of 0.0162 which is less than the 5 percent level of significance.

The coefficient of inflation was observed to have an adverse effect on economic growth in Sierra Leone. Inflation had a value of -0.2164 which means that if inflation increased by one percent, the level of economic growth in Sierra Leone declined by 0.216 percent which is consistent with theory. This result was also significant given that the p-value of the coefficient was 0.0352.

Thirdly, the interest rate coefficient was recorded as -2.394649 which means that a unit increase in the interest rates drops the level of economic growth by 2.394 percent. As the probability value of this coefficient was 0.0155, this relationship was statistically significant. This finding makes economic sense as interest rates represent the cost of

money hence if that cost is on an upward trend, owing to the increasing cost of doing business, we expect that the economy will shrink or decline.

Lastly, the model had a constant value of 27.14003 which means that holding all other factors included in the model constant, it is expected that Sierra Leone's economy will grow by 27.14 percent. Aside from the variables included in the model, other factors such as employment levels, the level of technology and capital stocks could help explain changes in economic growth. Hence this constant value is a representation of these and other potential variables that can influence growth.

The overall model is highly statistically significant as shown by the probability value of the F-statistic (0.0001). Moreover, the Durbin-Watson statistic of 3.176288 confirms the existence of no autocorrelation in the residuals and therefore ensures that the estimated results are not spurious.

## 4.9 Diagnostic Test

Economic growth was subjected to various diagnostics tests. The model was tested for serial correlation, heteroscedasticity, normality and stability. These diagnostic checks are based on the null hypothesis that: EZ there is no serial correlation for the LM test; there is normality for the Jarque-Bera test, there is no heteroscedasticity for the White heteroscedasticity test and all coefficients are stable.

## 4.9.1 Serial Correlation

The null hypothesis cannot be rejected as the probability value is greater than the normal 5 percent requirement of no serial correlation in the model. Therefore, the model is free from serial correlation as shown in Table 4.8.1

**Table 4.8.1:** Serial Correlation Result

| F-statistic = 7.558611 | prob. F (2, 23) = 0.4308 |
|---|---|
| Obs*R-squared = 20.28933 | prob. Chi-square (2) = 0.0000 |

**Source:** Eviews 12 output.

## 4.9.2 Heteroscedasticity Test: Breusch-Pagan-Godfrey

The estimated model passes the test for heteroscedasticity based on the regression of squared residuals on squared fitted values. The White Heteroscedasticity test below clearly shows that the p-value of about 0.3390 which is approximately 33.9 percent is more than the critical value of 5 percent.
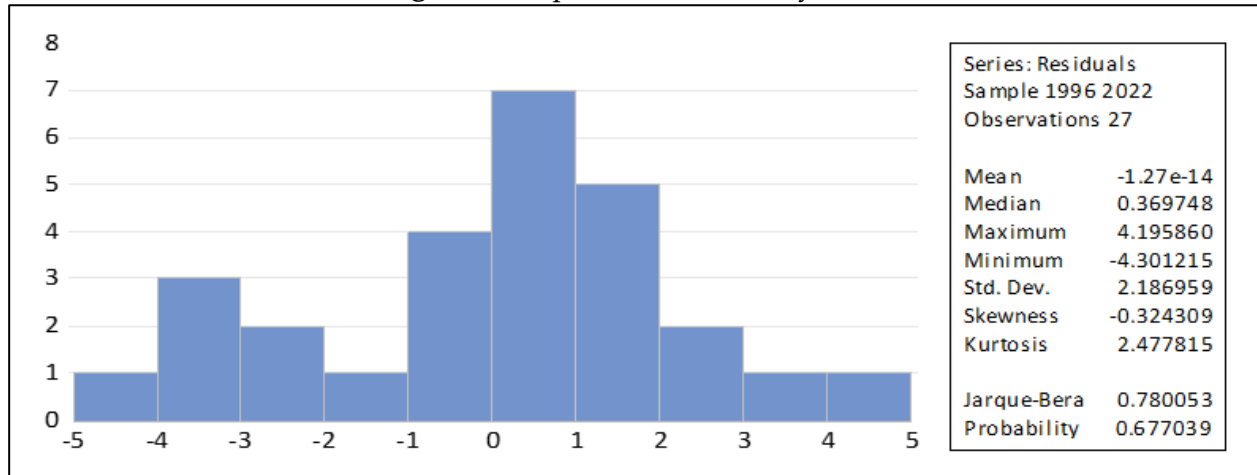
**Table 4.8.2:** Results of Heteroscedasticity

| F-statistic = 1.399810 | prob. F (11, 25) = 0.3390 |
|---|---|
| Obs*R-squared = 21.37440 | prob. Chi-Square (11) = 0.3165 |
| Scaled explained SS = 1.061580 | prob. Chi-Square (11) = 1.0000 |

**Source:** Eviews 12 output.

### 4.9.3 Normality Test

The model also passed the Normality test based on the Jarquer-Bera value of 0.780053 and the probability of 0.677039 which is above the required normal 5 percent level. Hence, the residuals are normally distributed across observations as shown in Figure 1.

**Figure 1:** Jarquer-Bera Normality Test



| Series: Residuals | |
| --- | --- |
| Sample 1996 2022 | |
| Observations 27 | |
| | |
| Mean | -1.27e-14 |
| Median | 0.369748 |
| Maximum | 4.195860 |
| Minimum | -4.301215 |
| Std. Dev. | 2.186959 |
| Skewness | -0.324309 |
| Kurtosis | 2.477815 |
| | |
| Jarque-Bera | 0.780053 |
| Probability | 0.677039 |

### 4.9.4 Stability Test

Pesaran and Pesaran (1997) suggest that the test for the stability for parameters using cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) plots be conducted after the model is estimated. This is done to get rid of any bias in the results of the estimated model due to unstable parameters. The results for CUSUM and The results depict that the plots of CUSUM and CUSUMSQ for the estimated ARDL model show CUSUMSQ are depicted in Figure 2 and Figure 3 respectively.

The absence of instability of the coefficients since the plots of all coefficients fall within the critical bounds at 5 percent significance level. Therefore, the estimated coefficients in the model are stable over the study period.

**Figure 2:** CUSUM for the Estimated ARDL
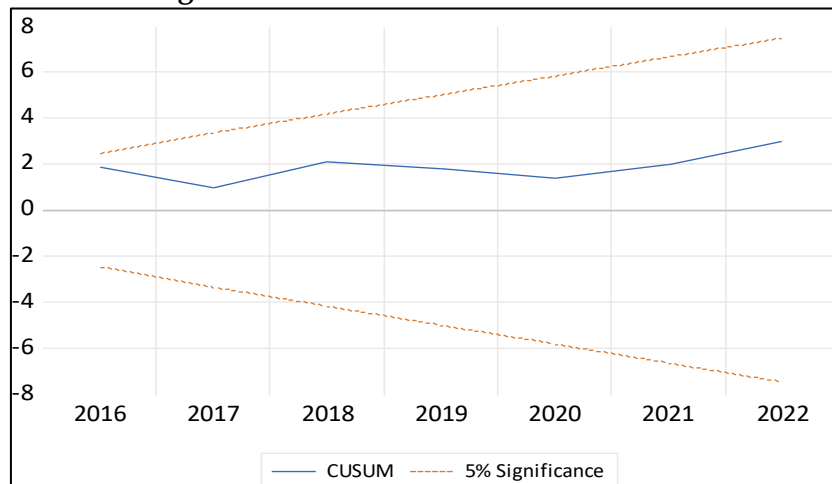


**Source:** Researchers' Calculations, 2024.

**Figure 3:** CUSUMSQ for the Estimated ARDL
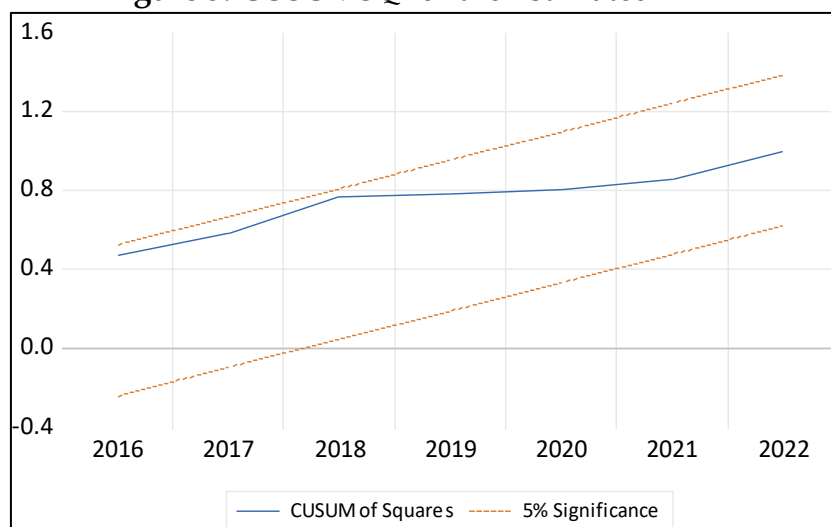


**Source:** Researchers' Calculations, 2024.

## 5. Conclusion

The objective of the study was to examine the nexus between credit creation and economic growth by commercial banks in Sierra Leone from 1992 to 2022. Commercial bank lending was proxied through private sector credit provision. The study used interest, real exchange rate and inflation as additional independent variables. GDP was used to represent economic growth which was the dependent variable and all the variables were logged for uniformity purposes. The ARDL technique was the model of choice used and the results of the regression showed that commercial bank lending had a direct effect on economic growth in Sierra Leone whilst both inflation and interest rates had a negative effect on economic growth.

With a coefficient of 0.72, the result showed that approximately 72 percent of the disequilibrium caused by previous year's shocks converges back to the long-run equilibrium in the current year.

The diagnostic test further revealed that approximately 93 percent of the variation in the dependent variable (export performance) is well explained by the exogenous variables, Overall model is highly statistically significant as shown by the probability value of the F-statistic (0.000023).

The plots of the cumulative sum of recursive residuals and the cumulative sum of squares of recursive residuals stability test for the model indicated that all the parameters estimated were stable over the study period.

**Conflict of Interest Statement**
The authors declare no conflicts of interest.

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