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Article

Inflation and Exchange Rate Impact on the Performance of Commercial Banks in Sierra Leone

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Abstract: This paper examines the impact of inflation and exchange rates on the performance of commercial banks in Sierra Leone. The performance metrics used are Return on Equity (ROE) and Return on Assets (ROA), which are influenced by economic stability, inflation, and exchange rate dynamics. The study highlights how the COVID-19 pandemic exacerbated inflationary pressures due to supply chain disruptions and currency rate fluctuations. It employs econometric methodologies to analyze the relationship between these economic variables and bank performance, focusing on an import-driven economy like Sierra Leone. The findings indicate that exchange rate volatility and inflation significantly affect commercial banks' profitability, with policy recommendations aimed at enhancing financial stability. The study uses data from 2008 to 2022, applying the ARDL cointegration technique to evaluate long-term relationships and short-term dynamics. The results underscore the importance of stabilizing inflation and exchange rates to ensure the robust performance of commercial banks in Sierra Leone.

Keywords: Inflation, Exchange Rate, ROE/ROA, ARDL, FSI, Sierra Leone

1. Introduction

A functioning international financial system depends on both inflation and currency rates, which impact corporate earnings. The equity (ROE) and asset (ROA) returns are two examples of Financial Soundness Indicators (FSIs) that are essential for evaluating these variables. ROE measures investment effectiveness, while ROA measures management's resource allocation for business income generation. The performance of a business, measured by ROE and ROA, is influenced by economic stability, inflation, and exchange rate dynamics. Due to supply-chain obstructions brought on by lockdown measures and pressure on exchange rates, the COVID-19 epidemic exposed import-driven economies to inflationary pressures (A. Jackson & Lerven, 2022).

Businesses heavily rely on imports for essential goods and services, leading to higher prices that can be passed on to consumers for profit margins or break-even. Due to importers' reliance on currency rates, this can affect local inflation and lead to variations in profit levels for enterprises, depending on the state of the economy. As demonstrated specifically for Sierra Leone, variations in the value of a currency are closely linked to inflation shown in Figure 1 below (Bangura et al., 2012). (JACKSON, 2020) draws attention to the movements that emerged after the Organization of African Unity summit and the World Bank's Structural Adjustment Program (SAP). In debt-ridden developing nations like Sierra Leone, this program which is now a component of the open-market economics methodology aims to mitigate budget deficits.

When it comes to meeting central bank pricing and financial stability objectives, the primary impact of currency rates on the macroeconomic stability of Sierra Leone prompted

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the adoption of Open Market Operations initiatives (Gazette & Cxl, 2009). Despite criticism from the IMF and other institutions, the central bank's direct intervention approach to auctioning foreign reserves in Sierra Leone was criticized for distorting free-market economics (IMF, 2015). Globalization, driven by electronic payment systems, has led to financial assets and services being valued in internationally recognized units like the US Dollar. For example, in Sierra Leone's currency rate market, supply and demand variables predominate, influencing the amounts of profit at commercial banks (Moyo & Tursoy, 2020).

Political meddling in Sierra Leone's financial system has negatively impacted commercial banks, with the Non-Performing Loan indicator consistently exceeding the tolerable limit. This negatively impacts banks' profitability and results in significant losses on balance sheet accounts, despite their commitments to meet minimum capital adequacy criteria under Basel agreements (E. A. Jackson & Jabbie, 2021). The pandemic posed significant risks to the banking sector, including customer loss of confidence, capital flight, unprofitable bank closures, and high unemployment (JACKSON, 2020).

This study looks at Sierra Leone's commercial banks' performance regarding exchange rates and inflation. Due to the nation's sizable import-led economy, a high level of imported goods is consumed, impacting consumer behavior and corporate operations. This leads to significant price pass-through effects and inflationary pressures because of a severe supply-side imbalance in demand. Using econometric methodologies, the goal of the study is to ascertain how inflation and exchange rates affect bank performance.

RESEARCH QUESTION

Are commercial banks in Sierra Leone impacted by exchange rates and inflation? **STUDY OBJECTIVES**

Consequently, the study is focused on two primary goals to address the emphasized question.

- To assess how Sierra Leone's banking sector performs to inflation and exchange rates.
- ii. Make recommendations for how the nation's banks should perform going forward.

SCOPE OF STUDY AND DATA SOURCES

With an emphasis on theoretical and empirical evaluations, the literature on how prices and currency rates impact the expansion of commercial banks is evaluated by the research. The test for unit root, econometric model, data description, and the estimation result are thoroughly covered. The analysis of results is detailed. The World Bank CEIC data source was used in this study. The report ends with recommendations for the central bank to stabilize Sierra Leone's financial system.

THEOTHERICAL LITERATURE REVIEW

The substantial effect that uncertainty has on the stability of national and international economies is demonstrated by the breakdown of the Bretton Woods system. This instability can be attributed to two main components: systematic exchange rate movement and exchange volatility (Yabu & Kimolo, 2020). Accurate projections of exchange rate trends suggest volatility disperses over time, impacting growth through investment and trade channels, and can be seen as a dispersing phenomenon (E. A. Jackson et al., 2021). The exchange rate negatively impacts investment, but it can also lead to positive outcomes, In line with "alternative price theory". According to this theory, stock volatility influences investing decisions more (Becker & Hall, 2009).

The quest for knowledge regarding how exchange rates affect macroeconomic performance is a continuous endeavor. (Hodrick, 1990) affirmed that stock markets are impacted by foreign exchange volatility since listed companies in emerging nations rely heavily on imports. This over-dependence negatively impacts the stock market's stability during a perturbed state of events (Taiwo & Adesola, 2013). To preserve both internal and

external economic balances, the study recommends that the best exchange rate strategies should concentrate on lowering real exchange rate pressure (Heriqbaldi et al., 2020). When economic activity is balanced to maintain a tolerable level of inflation and ensure full utilization of resources, it is referred to as internal balance (JACKSON, 2020). An economy's ability to sustainably finance its current account deficit through appropriate capital flows depends on its external balance.

(Zhan & Zhan, 2017) argument suggests that inflation can make a big difference in an economy. A rise in inflation can lead to unpredictable policy responses from the monetary authority, causing high uncertainty about inflation dynamics. Additionally, increased uncertainty can alter the price mechanism, leading to inefficient resource allocation and a negative output effect on the economy. utilizing the "cash-in-advance" concept, which combines risk aversion and prudent saving, (Parker & Preston, 2016) discovered that monetary authorities should be wary of inflation and that sustained inflation concerns can enhance production performance. The research demonstrates that sustained inflation uncertainty can lead to improved production performance (Bencivenga & Smith, 1991)

The findings indicate inflation and the banking sector's growth are negatively correlated and a positive relationship between inflation uncertainty and production performance. It links this to the 'fiscal story' theory, which suggests governments combine high inflation with financial sector restrictions to fund expenditure gaps. High real sector activities can catalyze economic growth, but in the long run, this could negatively impact bank performance.

EMPIRICAL LITERATURE REVIEW

This section looks at recent studies on how exchange rates and inflation affect Sierra Leonean banks' performance. A study examining the financial performance of four South African commercial banks (Standard Bank, Nedbank, Capitec Bank, and FirstRand) from 2003 to 2019 found a slender correlation between exchange rate and ROE, with inflation and ROE having a negative correlation, using models ARDL, FMOLS, and DOLS (Moyo & Tursoy, 2020).

(Adu et al., 2016) they used the GARCH panel data model to study how fluctuations in exchange rates affected the success of 14 commercial banks between 2007 and 2017. They discovered that fluctuations in exchange rates lead to a rise in currency rate volatility which lowers the capital adequacy ratio of banks and causes a financial and credit risk gap between bank lending and total deposits.

The paper discusses two perspectives on inflation's impact on the banking sector. The first suggests that inflation negatively impacts banking performance, affecting consumer purchasing power and the exchange rate regime. Second, if banks adjust interest rates in anticipation of future inflation so that revenue exceeds expenses through commercial operations, inflation may improve banks' performance. Both perspectives highlight the potential for inflation to disrupt economic growth.

The (Wamucii, 2010) study looked at the relationship between Kenyan commercial banks' finances and inflation between 2000 and 2009; to determine the type and intensity of the relationship, correlation coefficients were first analyzed. Banks increased their earnings in response to lower inflation, according to the SPSS study, proving the two variables' inverse relationship. Nonetheless, the relationship between all assets and prices is poor since it lacks any obvious pattern. Lower inflation has an impact on Kenyan commercial banks' profit margins, indicating that these institutions' total performance is positively impacted by independent variables (Batayneh et al., 2021). Additionally, they discovered a substantial, prices and the financial industry have an irregular negative association. The study reveals a rapid decline in bank lending activities due to rising inflation, negatively impacting banks' financial performance, and regressing under inflationary pressure, particularly before its threshold level.

The study investigates how exchange rates and inflation affect Sierra Leone's commercial banks' performance, a region with mixed outcomes in the empirical literature. Despite increasing research, there is a lack of published work on this topic. The study uses two models to explore these factors, extending the frontier and providing a unique perspective.

2. Materials and Methods

The adapted model (Ángeles & Gómez, 2000) suggests that firms must consider operational costs during investment, which pose high risks due to uncertainty in domestic production levels, as illustrated below in Equation 1:

$$P = Y(Q)$$
Eq. 1

Note: Y= currency rate; D(Q) = revenue of firm and P = price output. Equations 2 and 3 below show the result of applying the principle to the performance of commercial banks.

Two models ROE and ROA will be used in the investigation to examine how well Sierra Leonean commercial banks capitalize on their equity base considering several economic conditions, including the money supply, inflation, exchange rate dynamics, and inflationary pressure. Where: ROE = Return on Equity; ROA = Return on Asset, NER = Nominal rate of exchange, INF = rate of inflation, and MS = supply of money (Broad Money(M2)).

DATA DESCRIPTION

This research makes use of a composite of financial strength indicators (FSIs) from all recognized commercial banks in Sierra Leone from 2008 to 2022. These FSIs, which include nominal exchange rate, inflation rate, yield on assets, and yield on equities, are taken from the Central Bank of Sierra Leone data source.

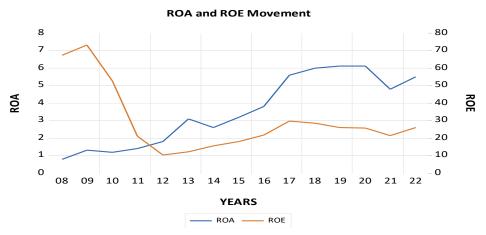
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Figure 1: Movement of Exchange Rate and Inflation

Source: Own Calculation, (processed using E-Views 12)

Figure 1 shows the co-movement of NER and INF in commercial banks' performance during scoping. The exchange rate dominates, indicating low domestic economy output and heavy reliance on imported goods and services. This increases the likelihood that a parallel market will control the nation's exchange rate valuation (JACKSON, 2020). Commercial banks' services, which are equally utilizing imported goods and services, have a high pass-through effect, potentially causing a pendulum swing in their overall economic performance.

Figure 2: Movement in ROE and ROA



Source: Own Calculation, (processed using E-Views 12)

A sequence of crises in commercial banks, namely in 2014 and 2017, is depicted in Figure 2 by the changes in ROE and ROA throughout the inquiry. Poor management across the banking industry is attributed to these issues. Unquestionably, provisioning at state-owned commercial banks is impacted by large nonperforming loans (NPLs) during the BSL's 2013–2018 temporary intervention (Osei-Assibey & Augstine Bockarie, 2013).

TEST FOR UNIT ROOT

The unit root test is crucial for evaluating econometric model specificity and establishing variable stationarity. It ensures variables are integrated into an order of one to prevent erroneous findings. The best lag length is determined using Philip Peron and Augmented Dickey-Fuller tests and the Akaike Information Criterion. The outcomes validate the ARDL limitations approach for long-term partnerships as shown in table 1 below.

ADF PP **Parameters** i(0)i (1) i(0)i(1)LINF -2.306451 -3.124374*** -1.46928 -1.981979*** **LNER** -0.947727 -30.25533*** -1.189525 -0.195317*** -3.077308*** **LMS** -3.077308*** -2.806692 -2.579623 **LROA** -1.521158 -3.483828*** -1.521158 -4.902350*** **LROE** -4.901155 -2.254213*** -1.560272 -2.254213***

Table 1: Outcomes of ADF and PP Test of Unit Root

Source: Own Calculation, (processed using E-Views 12) *** = 1% Significance *THE ARDL MODEL*

The study looks at how prices and currency rates impact Sierra Leonean commercial banks' financial performance from 2008 to 2022 using the ARDL technique as suggested (Pesaran, 2008). This strategy offers certain econometric benefits over the maximum likelihood-based strategy put out by (Testing et al., 2016) and (Groen & Kleibergen, 2003). The bounds test doesn't require pre-testing series for integration order, regardless of I(1), I(0), or mutual integration. ARDL modeling captures the data-generating process with enough lags for specific frameworks (Majid, 2008).

This technique addresses endogeneity problems and corrects for serial correlation in ARDL models with appropriate lags, (Pesaran, 2008). (Edison & Barbosa, 2021) suggest endogeneity is less problematic with free serial correlation. The study uses the ARDL approach, which assumes all variables are endogenous and estimates both short- and long-term parameters simultaneously. This is important since it's unclear if macroeconomic

factors and economic growth are causally related. The study confirms the points outlined by (Nkoro & Uko, 2016), reflecting on the Unit Root outcome tests

The ARDL cointegration technique is a unique model choice for dealing with model misspecification, as it addresses the criteria for its use and its underlying benefits, as outlined in the objectives. When compared to the cointegration test (Pesaran, 2008), the ARDL offers better small sample qualities. The method has recently acquired favor in empirical research and is well-suited for examining the underlying relationship. Equations (4) and (5) have the following ARDL representation:

Where: Δ is the operator of difference, p is the lag length, L is the chosen variables' logarithm, and ε_t is presumptively uncorrelated in series. β_{0i} is Equation's intercept whereas $\beta_{1i}, \beta_{2i}, \dots, \beta_{ni}$ the long-run equilibrium's adjustment's short-run dynamic coefficients. Using the Akaike Information Criterion (AIC), a parsimonious model is chosen for the ARDL model, which is then used for long-run and error correction estimates:

$$\Delta LROE_t = \beta_{0i} + \sum_{i=1}^p \beta_{1i} \Delta LNER_{t-1} + \sum_{i=1}^p \beta_{2i} \Delta LINF_{t-1} + \sum_{i=1}^p \beta_{3i} \Delta LMS_{t-1} + \pi ECT_t + \varepsilon_t$$
 Eq.6
$$\Delta LROA_t = \beta_{0i} + \sum_{i=1}^p \beta_{1i} \Delta LNER_{t-1} + \sum_{i=1}^p \beta_{2i} \Delta LINF_{t-1} + \sum_{i=1}^p \beta_{3i} \Delta LMS_{t-1} + \pi ECT_t + \varepsilon_t$$
 Eq.7

 $ECT = (Y_{t-1} - \varphi V_t)$ is the error correction term, $\varphi = \sum_{i=1}^p \alpha$ and the long-term factor $\pi = (1 - \sum_{i=1}^p \beta)$ is the parameter representing a negative indicator for adjusting speed. For additional evidence of a cointegrating link, it is anticipated that the lag error correction term ratio (π) will be negative and statistically significant.

Utilizing the F-statistic, the bounds test to cointegration verifies the long-term equilibrium between the variables. When a long-run connection is contrasted to the absence of a cointegration null hypothesis (H_0 : $p_1 = p_n = 0$) it indicates a cointegration relationship (H_1 : $p_1 \neq p_n \neq 0$). The test contrasts critical value limitations with the F-statistic, generating two cointegration decision bounds: All series are assumed to be I (1) in the upper limit and I (0) in the lower limit.

Cointegration is indicated when F-statistics exceed the upper bound critical value, indicating a long-term link between parameters. No inference should be made if F-statistics are less than the lower limit.

lr Lag logl fpe aic hq $9.76e^{09}$ 37.18074 37.40897 37.15961 na 255.2652 174.5893 92.20104* 4562550.* 29.22704* 30.59645* 1 29.10027*

Table 2: Selection of Lag Length Criteria

Source: Own Calculation, (processed using E-Views 12): * lag order selection criterion:

The ideal period for gathering data is established by the Akaike Information Criterion. Model selection is facilitated by AIC, which determines the model's performance quality for HQ and FPE. The AIC framework provides a better measure of model quality through cross-validation if out-of-sample prediction error differs from in-sample prediction error as shown in Table 2 above. AIC estimates the information lost by a model by balancing the model's goodness of fit with its simplicity, mitigating the danger of both an underfit and overfit.

Table 3: The Result for Equation 2 Bound Test Cointegration Output

Test Stats	Value	Level of Lag	Significant	Critical Valu	ues of Bound
				(The restric	ted intercept
				and no trend) *
				i (0)	i (1)
			1%	3.65	4.66
F-Statistics	3.019455	1	5%	2.79	3.67
			10%	2.37	3.2

Source: Own Calculation, (processed using E-Views 12)

The study is restricted to the dynamic short-run because ROE and predictable monetary factors do not exhibit a long-run linear connection. The model's F-statistic, which is below the maximum constraint of 3.67 at the 5% significance level, is 3.019455.

Table 4: Results of Short-term Dynamic

variables	values	std. error	t-Stats	prob
D(ROE (-1))	0.500937	0.220377	4.768825*	0.1316
D(NER)	-8.485096	1.539157	-5.512819*	0.1142
D(NER (-1))	0.394722	0.419179	0.941655**	0.0519
D(INF)	1.777855	0.190032	9.355571**	0.0528
D(INF (-1))	-1.156643	0.345069	-3.351919*	0.1846
D(MS)	0.031170	0.000892	3.496504*	0.1773
D(MS (-1))	-0.002016	0.000572	-3.523045*	0.1761
ECT(-1)	-0.595321	0.126073	-4.722024*	0.1329

Source: Own Calculation, (processed using E-Views 12): Note *** 1%, ** 5% and * 10%

DIAGNOSTIC

The r-Squared	0.442482
Adj. r-Squared	0.163724
The Serial Corr. (LM Test)	0.0183
The heteroscedasticity	0.2684
The normality. Test (Jacque Bera)	0.335399
The f-statistics	0.267611

Table 4 displays the ARDL (1,0,0) short-run dynamics. With a significant negative coefficient of lag error correction term of -0.595321, significant at the 10% level, it demonstrates a cointegrating link between ROE and a subset of explanatory financial sector indicators (FSI). The disequilibrium brought about by the shocks of the previous month has shown a 59.5% convergence to the equilibrium over the extended period this month.

TABLE 5: Result for Equation 3 Bound Test Cointegration Output

Test Stats	Value	Level of Lag	Significant	Critical Valu	es of Bound
				(The restric	ted intercept
				and no trend)	*
				i (0)	i (1)
			1%	3.65	4.66
F-Statistics	3.341339	1	5%	2.79	3.67
			10%	2.37	3.2

Source: Own Calculation, (processed using E-Views 12)

At the 5% significance level, the model's F-statistic, 3.341339, is below the higher limiting bound (3.67), suggesting the lack of a long-run linear relationship between predictable financial inputs and ROA. Therefore, analysis is limited to the dynamic short run.

Table 6: Results of Short-term Dynamic

variables	values	std. error	t-Stats	prob
D(ROA (-1))	-0.776805	0.051448	-15.09876**	0.0421
D(NER)	-0.027498	0.052513	-0.523638*	0.1929
D(NER (-1))	0.736140	0.078795	9.342482**	0.0579
D(INF)	0.041224	0.010425	3.954473*	0.1577
D(INF (-1))	-0.126826	0.014630	8.668892**	0.0531
D(MS)	-0.000466	3.88e ⁻⁰⁵	-11.98911**	0.0530
D(MS (-1))	-0.000250	3.35e ⁻⁰⁵	-7.458444**	0.0548
ECT(-1)	-0.049440	0.002674	-18.49002**	0.0363

Source: Own Calculation, (processed using E-Views 12): Note *** 1%, ** 5%, and * 10%

DIAGNOSTIC

The r-Squared	0.724524
Adj. r-Squared	0.449047
The serial Corr. (LM Test)	0.2585
The heteroscedasticity	0.8307
The normality Test (Jacque Bera)	0.34991
The f-statistics	0.132187

The table displays the ARDL (1, 0, 1) short-run dynamics. The lagged error correction terms of statistical significance have a negative coefficient, (-0.049440), indicating a converging cointegrating relationship between ROA and a few selected explanatory factors. Based on this, In the current month, 49.4% of the imbalance brought about by the shocks from the prior month merges into the long-term equilibrium.

3. Results

At lag one, the Return on Equity (ROE) log displays a positive sign and significantly affects the current ROE at the 10% level, indicating that 0.500937 or 50.9% of the current ROE is explained by the 1 lag period. The study indicates that financial institutions typically reinvest a significant portion of ROE, with inflation having a favorable effect on ROE at the 5% threshold in the dynamic short run. The Leone currency's average market value relative to the US dollar will decrease by 1% resulting in a 1.777855 short-term appreciation, as inflation directly boosts return on equity (ROE). In China, (Tan & Floros, 2012) Inflation, stock market expansion, bank profitability, cost-effectiveness, and the banking sector were all highly correlated.

A 1% drop in the value of the Leone currency results in an 8.485096 or 8.5% loss in the ROE due to a merely statistically significant rate of nominal exchange at 10%. The study (et al., 2020) explored how exchange rate fluctuation affected the profitability of 14 Iranian commercial banks between 2007 and 2017, highlighting the significant role banks play in the financial system. The study found that exchange rate volatility negatively impacts banks' capital return ratio as this raises the bank lending to total deposit ratio, leading to a financial gap and a credit risk gap. The supply of money rising by 1% would result in a 0.031170, or 31.7%, increase in the ROE. The supply of money at a 10% level and one lag is highly significant.

After one lag period, the fluctuating return on assets (ROA) short-run equation demonstrates a large increase at the 5% level, which translates into a 0.776805 gain in the current ROA of 1%. A 5% increase in inflation is expected to negatively impact ROA, resulting in a 12.6% decrease, with a percentage point increase in inflation being statistically significant. (Ben Naceur & Ghazouani, 2009) found out that, the banking industry's performance is adversely affected by inflation, notwithstanding insufficient availability of a threshold level based on data from many countries, after accounting for simultaneity and disregarding variable biases. Conversely, the money supply is negative in the first lag and is substantial at the 5% level, whereas NER is positive in the first lag.

4. Conclusion

Inflation negatively impacts both banking sector performance and the exchange rate (NER) and this is exactly what happens in Sierra Leone, as banks may have considered the distorting effect of inflation on their profitability. Normally, banks would reallocate resources to concentrate on profit and losses from currency inflation. Commercial banks are frequently impacted by inflationary pressures, necessitating government and monetary authority intervention to resolve the exchange rate issue. Inflationary pressure and high exchange rate demand in the domestic sector can be mitigated by increasing the country's ability to produce necessities. It will also lessen the quick pass-through effect on pricing and assist in paying import expenditures.

In addition to addressing recurring exchange rate crises and inflation increases, the country's banking sector can be made more stable by enacting strict regulatory measures and legal tools, as shown in recent acts (Gazette & Cxl, 2009). The nation's overreliance on imports for domestic consumption should be addressed, and the central bank should step up its oversight of the banking sector (JACKSON, 2020). About maintaining the financial system's stability within Sierra Leone's economy, the following recommendations are deemed pertinent:

To prevent exchange rate crises and maintain the stability of the monetary and financial systems, policymakers should support foreign direct investment and export revenue from valuable commodities like iron ore.

To control inflation and lower expectations for inflation, to stabilize the financial sector, the Central Bank of Sierra Leone (BSL) has acted. To put into practice successful policy measures, the Ministry of Finance and the BSL must collaborate.

The profitability and hazards associated with individual banks should be evaluated by a panel data econometrics study that takes inflation and exchange rates into account and evaluates the suitability of other Financial System Sector Indicators (FSIs).

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