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IMPACT OF EXCHANGE RATE AND INFLATION ON COMMERCIAL BANKS' PERFORMANCE IN SIERRA LEONE

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Abstract: *This study was initiated with the intention of examining the impact of exchange rate and inflation on the performance of commercial banks in Sierra Leone. The study utilises data for all commercial banks in Sierra Leone during the period 2009Q1-2020Q2. To measure the performance of commercial banks, Return on Equity and Return of Asset were used as the dependent variables, while inflation and exchange rate as the independent variables in the two model equations. In a bid to address the objectives of the study, the Auto Regressive Distributed Lag model was used. The findings indicate that inflation has a positive effect on banking sector performance, while exchange rate exert negative spillover effect on the overall economy. Since inflationary pressures are common phenomenon to macroeconomic stability, which normally impact on the performance of commercial banks, it is therefore recommended for both the monetary and government authorities to work collaboratively as a way of addressing exchange rate pressure. This will make it worthwhile for the banking system to serve its purpose of championing sustained growth and development in Sierra Leone.*

Keywords: *Bank Performance, Inflation, Exchange Rate, Sierra Leone, ROE, ROA, ARDL*

Jel Classification: *E31, F31, F41, G10*

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1. Introduction

Inflation and exchange rate are of critical concerns for stable financial system in the world economy. These two variables are highly significant in influencing business profitability when measuring the relevance of Financial Soundness Indicators (FSIs) like Return on Equity (ROE) and Return on Asset (ROA). With reference to the financial sector, ROE indicator makes it possible for investors to measure the effectiveness of their investments in generating income, while ROA indicator provides an indication or measurement of management's use of resources or assets in generating income for businesses.

The performance of a business when measured on the criteria of ROE and ROA depend on several factors - notable highlights include the stability of an economic system, particularly inflation and exchange rate dynamics. The influence of external disturbances as witnessed more recently with COVID19 in the global economy exposed the vulnerability of highly import driven economies to inflationary pressures – probable explanation for this is to do with the dominance of exchange rate pressure and also supply-chain bottlenecks resulting from the decision to lockdown economies (Jackson, 2021 and Jackson, 2020). Given the heavy reliance on businesses to import essential goods and services, there is a tendency for costs to be translated into higher prices, which can be easily pass-through to consumers as a way of achieving reasonable profit margin or at worse break-even. In such a situation, there is a tendency possibility for profits to fluctuate on account of importers heavy reliance on exchange rate to complete transactions. Such situation(s) normally impact directly on domestic inflation due to the continued pass-through effect of costs, which in most cases comes with a lag. On the whole, this could result in higher or lower levels of profit to businesses, which also depends on the prevailing situation within an economy.

Specific to Sierra Leone, there is a direct connection between movements in exchange rate and inflation as highlighted in Figure 1 below (Jackson et al, 2020; Jackson, Tamuke and Jabbie, 20120; Bangura et al, 2012). Such movements as indicated by Jackson and Jabbie (2020) started manifesting itself in the aftermath of the Organisation of African Unity (OAU) summit; this was rapidly followed by series of re-adjustments in the economy under the brand name of Structural Adjustment Program (SAP). This was originally initiated by the World Bank and now rebranded

as part of the open-market economics approach, now skewed in the nomenclature of ECF/IMF program as a way of cushioning persistent budget deficits in debt-ridden (developing) economies like Sierra Leone (Jackson, 2018).

Given the heavy influence of exchange rate in determining the state of macroeconomic stability in the Sierra Leone economy and particularly in addressing price and financial stability mandates of the central bank (BSL Act, 2019), several measures connected with Open Market Operations (OMO) were instituted. In the face of IMF and other institutions present in Sierra Leone, direct intervention approach introduced by the central bank to auction foreign reserves in a bid to quell the situation was brought under intense criticism, due to its motive of distorting free-market economics (IMF, 2015).

With increasing need for globalization, spearheaded through electronic payment system, it is now almost certain for financial assets and services to be valued in the equivalence of an internationally recognised unit of account, notably the United States Dollar. The influence of both supply and demand factors are considered dominant players in the exchange rate market as witnessed in the case with Sierra Leone – an influencing factor in determining profit level of commercial banks (Moyo and Tursoy, 2020). The performance of commercial banks in Sierra Leone was brought under spotlight on account of the dominance of political meddling in the country's financial system. With reference to state-owned commercial banks, Non-Performing Loan (NPL) indicator persistently went above the tolerable limit and this on the whole, translated negatively on banks' profitability. This also resulted in huge losses on banks' balance sheet account given their commitments to make relevant provisions in meeting the minimum capital adequacy criteria as determined under series of the Basel agreements (Jackson and Jabbie, 2020). This also brought about high risks to the banking sector in areas pertaining to customers' loss of confidence, capital flights, closure of unprofitable banks and high unemployment (Jabbie and Jackson, 2020).

In view of the above discourses, this study is motivated to explore the influence of both exchange rate and inflation on the performance of commercial banks in Sierra Leone. Owing to the dominance of a large import-led market in the Sierra Leone economy to address domestic consumption of goods and services, consumers' habit formation were seen to be diverting

towards high consumption of imported items. This is also true with the management and operation of commercial banks' businesses, which also rely on their international links to address domestic shortfall in foreign currency transactions. This on the whole, has given rise to high pass-through effect of prices to consumers, and ultimately resulting in inflationary pressures due to high level imbalance in demand over supply. It is therefore, the aim of this study to utilise appropriate econometric technique to estimate the real impact of both exchange rate and inflation on the performance of banks in Sierra Leone.

On the basis of the above motivation statements, this study is intended to explore the following research question: *Does exchange rate and inflation impact the commercial banks' performance operation in Sierra Leone?*

To answer the highlighted question, the paper is therefore carved on two main objectives: (i) *Examine the effects of Inflation and exchange rate on the performance of the Sierra Leone banking sector using appropriate econometric model as identified within the scoping period, 2009Q1 – 2020Q2 and (ii) Proffer recommended suggestions for the future direction of banks performance in the country.*

The rest of the paper is detailed as follows: Section two provides detailed review of literatures pertaining to the influence of exchange rate and inflation on the performance of commercial banks, which is further sub-sectioned into theoretical and empirical reviews. Section three provides a description of the Methodology, sub-sectioned to address the theoretical framework, data description, Unit Root test, the Econometric model and estimation output. Section four provides detailed description of the analysis of results, while section five outline evidence of the post-diagnostic and stability test results. Finally, section six concludes, with highlights of suggested recommendations for implementation across the banking sector and backed by central bank policy actions to stabilise the financial system in Sierra Leone.

2. Literature Review

2.1. Theoretical Linkage and Review

Uncertainty surrounding exchange rate dynamics is very influential in stabilizing both domestic and the world economy; this could be attested with the collapse of Bretton Wood

system as emphasised in a study on exchange rate and FDI produced by Alabi (2003). The upheaval caused by such collapse can be decomposed into two components; firstly, systematic movement of exchange rate and secondly, exchange volatility (Alabi, 2003; Darby et al., 1999). With accurate projection about trending movements in exchange rate, volatility could be seen to disperse over a given period of time and the impact of this can also be felt on growth through variety of channels, notably investment and trade (Bangura et al, 2013). While it is convincingly proven that exchange rate adversely impact investment, there are also some level of positive outcomes about its uncertainty, which is said to stem from the '*option price theory*'; this asserts that decision towards investment increase with an increase in the level of stock volatility (Accam, 1997).

Pursued effort to obtain an answer pertaining to the impact of exchange rate on macroeconomic performance is an ongoing venture. On this note, Hodrick (1990) confirmed that the effect of volatility of foreign exchange on stock market could be attributed to high dependence on imports by quoted firms in developing countries. The outcome of such over-dependence on imports normally have negative impact on the stability of stock market during perturbed state of events (Taiwo and Adesola, 2013).

A study pursued by Agu (2002) also proved that optimal exchange rate policies should be focused in subduing real exchange rate pressure in a bid to maintain both internal and external balances in an economy. Internal balance in this context refers to the level of economic activities considered to be consistent with a reasonable level of inflation, while at the same time maintaining full utilization of resources (Jabbie and Jackson, 2020). External balance on the other hand clarify terms of payment equilibrium, which is required to maintain sustainable level of current account deficit financing, backed by a reasonable means of capital flow in an economy.

Friedman (1977) hypothesized an informal argument in relation to the real effect of inflation in an economy. Such a view is epitomised in two parts; the first relates to the fact that an increase in inflation has the possibility of inducing unpredictable policy response from the monetary authority, which therefore could evoke high uncertainty about inflation dynamics. In the second hypothetical viewpoint, Friedman noted that increase level of uncertainty about

inflation can also alter price mechanism, which in effect can lead to inefficient allocation of resources, thereby resulting in negative output effect in an economy. Ball (1992) made an attempt to formalize Friedman's first hypothesis through the use of '*cash-in-advance*' model, which makes provision for precautionary savings and risk aversion – the outcome shows that continued inflation uncertainty can result in positive output performance.

Bencivernga and Smith (1992) also hypothesized the relationship between inflation and financial sector performance by linking it with the theory of the '*fiscal story*'; this simply asserts that governments would normally seek to combine high inflation with variety of restrictions in the financial sector to fund expenditure gap. In that regard, where financial service is assumed to be a normal good, this means that high levels of real sector activities could catalyze positive growth in an economy, and eventually resulting in favourable developments across the banking system. Hence, in the long run such outcome could exert negative relationship between inflation and bank performance.

2.2. Empirical review

While efforts continuously pursued to address influences of exchange rate and inflation on bank performances, there are still potential gaps in the link between theoretical and empirical outcomes of such studies. Therefore, this section is intended to review contemporary literatures, with the focus of building concrete justification for the specific estimation intended to be utilised in determining the impact of exchange rate and inflation on the performance of commercial banks in Sierra Leone.

Moyo and Tursoy (2020) utilised Panel Data study to examine the impact of inflation and exchange rate on the financial performance of commercial banks in South Africa. Four of the largest commercial banks in South Africa were the focus of the study and these include Standard bank, Nedbank, Capitec bank and Firstrand bank during the period 2003-2019. Return on Equity (ROE) was utilised as the dependent variable for measuring bank performances, while inflation and exchange rate were the independent variables. In a bid to achieve the study objective, ARDL, FMOLS and DOLS were utilised as the main models. The findings manifest inverse relationship

existing between inflation and ROE, while a weak relationship was established between exchange rate and ROE.

Keshtgar et al (2020) also pursued a study to capture the influence of commercial banks' role on the financial system in Iran. The impact of exchange rate volatility was examined as a determinant with 14 commercial banks' performance during the scoping period of 2007-2017. Utilisation of GARCH panel data model for liquidity and indicators of profitability shows that exchange rate has a negative and statistical significant effect on banks' capital adequacy ratio. The study outcome also shows that exchange rate volatility as a determinant, increase the ratio of bank lending to total deposit as it resulted in an increase in financial gap, which ultimately leads to credit risk gap.

Umar et al (2014) carried out a study to assess the effect of inflation on the financial sector in Nigeria. The paper noted two divergent views: the first is that inflation has an adverse effect on banking sector performance, while spillover effects has proven to be harmful to the economy. This shows that inflation has a way of interfering with purchasing power of consumers and the exchange rate regime, in addition to factors like opportunity cost of holding currency in the future, worsening of loan policy, disruption of business plans and equity holding performance of banks. The second holds the view that inflation can lead to an increase in banks' performance, provided banks are able to anticipate future inflation, while also adjusting interest rate in a bid to generate higher levels of revenue over cost through business operation.

Wamucii (2010) pursued a study that examined the relationship between inflation and commercial banks' finances in Kenya during the scoping period 2000-2009. The initial process commenced with an analysis of correlation coefficients in a bid to initiate the nature and strengths of relationship in the variables utilised. The analysis was done using Statistical Package for Social Science (SPSS) and the outcome indicate that banks adjusted their profits upwards with reduced level of inflation, which thereby signify an inverse relationship between the two variables. Outcome from the relationship between inflation and total assets shows no clear pattern, thereby indicating weak level of relationship. Conclusion from the study shows that banks' profits manifest a stable pattern, indicating that decrease levels of inflation have resultant

effect on profit margin. This means that the independent variables utilised have a positive impact on the overall performance of commercial banks in Kenya.

Boyd et al (2001) explored in their study a non-linear, but significant negative relationship between inflation and banking sector. This proved the existence of a fast and deteriorating trend on bank lending activities with increased level of inflation, which also impacted negatively on banks' financial performance. The outcome also proved that activities of bank lending regressed under condition of inflationary pressure, and more so prior to its threshold level.

Studies on the impact of exchange rate and inflation on commercial banks' performance is thought to have portrayed mixed outcomes across countries as revealed in the empirical literatures covered. Despite increasing literatures on the impact of exchange rate and inflation on banks' performance, the authors are convinced that there is a vacuum of published work pertaining to a single study on the impact of exchange rate and inflation on the performance of commercial banks in Sierra Leone. Therefore, this study is unique in its approach to extend the frontier by utilising two models to explore the impact of both exchange rate and inflation on commercial banks' performance.

3. Methodology

3.1. Theoretical Framework

Adaptation of the Darby et al (1999) model suggests that in the process of investment, firms in general will need to consider costs borne throughout their operational activities. There is high risks attached to this given the prevalence of uncertainty faced by domestic firms' production level. Hence, the inverse function is shown in Equation 1 below:

$$P = Y(Q) \qquad \text{Eq. 1}$$

Where: Y is the Exchange Rate; D(Q) is firm's revenue and P is Output price.

Applying the aforementioned concept to determine performance of commercial banks, the outcome is hereby expressed as indicated in equations 2 and 3 below:

$$ROA = f(NEXR, Infl) \qquad ROE = f(NEXR\ Infl)$$

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Where: ROE is the Return on Equity; this tells us how effective commercial banks in Sierra Leone are taking advantage of their capital or equity base. NEXR is the Nominal Exchange Rate and Infl is the Inflation Rate.

The study will utilise two models (ROE and ROA) as indicated in equations 2 and 3 above, and these are influenced by variables like exchange rate dynamics and inflationary pressure in the Sierra Leone economy.

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3.2. Data Description

Data for this study is a composite of FSIs produced by all established commercial banks in Sierra Leon spanning 2009Q1-2020Q2. Therefore, variables for the two models include "*Nominal Exchange Rate (NEXR) and Inflation Rate (Infl)* extracted from the Bank of Sierra Leone data warehouse, and FSIs like *Return on Equity (ROE) and Return on Asset (ROA)*" compiled by the Financial Stability Department.

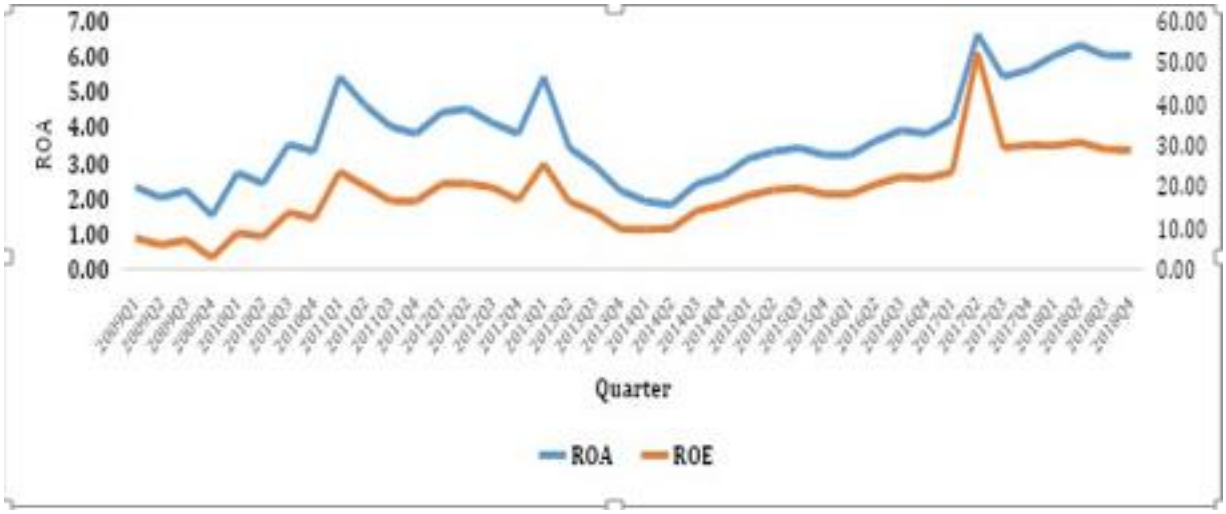
Figure 1: Exchange Rate and Inflation Movement

Source: *EVIEWS Output*

Figure 1 above provides an indication of NEXR and Infl co-movement, which are critical in determining commercial banks performance during the scoping period. Exchange rate seems to be the domineering factor, which is indicative of low output in the domestic economy and also, the heavy reliance on imported (inelastic) goods and services to support domestic

consumption needs. This makes it highly possible for parallel market to dominate exchange rate valuation in the country (Jabbie and Jackson, 2020). On the whole, there is a high pass-through effect for services provided by commercial banks that are equally utilising imported goods and services as part of their daily business operations. In effect, there is a high possibility of this resulting in a pendulum swing on the overall performance of banks in the economy.

Figure 2: Chart Showing Movement in ROE and ROA



Source: *EVIEWS Output*

Figure 2 above shows movement of both ROE and ROA during the period under investigation, which is an attestation of good and bad times, where commercial banks are perceived to have struggled through series of crises, particularly in 2014Q1 and with the worse outcome in 2017Q3. In general, one could attribute this to poor management across the banking industry. As noticed, the influence of high Non-Performing Loans (NPLs) and their provisioning as witnessed during the interim intervention (2013-2018) by the BSL with the two state-owned commercial banks is an attestation of the aforementioned discourse pertaining to poor operational management in the financial sector (Osei-Assibey and Bockarie, 2013).

3.3. Unit Root Test

Unit root test is very important in determining stationarity of variables and also in making informed choices about the specificity of econometric model utilised in the estimation process. Even though the Bounds test for cointegration does not require pre-testing of the variables for unit root, this test must be conducted in order to satisfy that variables utilised are integrated to an order of one. This approach is necessary to avoid problem of spurious results. The Augmented DickeyFuller (ADF) and Philip Peron (PP) tests are employed as shown in Table 1. The Akaike Information Criterion (AIC) is used to determine the optimal lag length included in the tests. The results suggest that all the variables are of mixed order of integration as shown in Table 1 below. This justify the use of ARDL bounds approach to determine the long-run relationships among the variables.

Table 1: ADF and PP Unit Root Test Outcomes

	ADF		PP	
Variable	**I(0)**	**I(1)**	**I(0)**	**I(1)**
LINFL	-1.120552	-3.790175***	-0.744588	-3.790175***
LNEXR	-0.283230	-4.105233***	-0.209698	-4.085759***
ROE	-2.367242	-10.61169***	-2.145295	-10.46062***
ROA	-1.710048	-8.845729***	-1.640841	-8.766278***

Note: *** = 1% significance

3.4. The Econometric Model

3.4.1. Auto-Regressive Distributed Lag (ARDL) Model

Since the focus of this chapter is to establish the relationship between *Exchange Rate and Inflation on the (financial) performance of commercial banks in Sierra Leone (2009Q1 – 2020Q2)*, we have resorted to adopting cointegration analysis and error correction techniques as justified from the unit root test outcomes. Therefore, the Autoregressive Distributed Lag (ARDL) approach (that is. the bounds testing approach to cointegration) popularized by Pesaran and Shin

(1999) and Pesaran et al (2001) is used in the study. This approach has some econometric advantages over the Engle and Granger (1987) and the maximum likelihood-based approach proposed by Johansen and Juselius (1990) and Johansen (1991) cointegration techniques. Firstly, the bounds test does not require pre-testing of the series to determine their order of integration since the test can be conducted regardless of whether they are purely I(1), purely I(0), or mutually integrated. Secondly, the ARDL modelling incorporates sufficient number of lags to capture the data generating process, general to specific modelling framework (Laurenceson et. al, 2008).

Also, endogeneity problems are addressed in this technique (Barrie, 2020). According to Pesaran and Shin (1999), modelling ARDL with the appropriate lags will correct for both serial correlation and endogeneity problems. Jalil et al (2010) argue that endogeneity is less of a problem if the estimated ARDL model is free of serial correlation. In this approach, all the variables are assumed to be endogenous and the long run and short-run parameters of the model are estimated simultaneously (Khan et al, 2005). The issue of endogeneity is particularly relevant since the causal relationship between macroeconomic determinants and economic growth cannot be ascertained beforehand. The literature suggests that a bidirectional relationship could exist between the chosen macroeconomic determinants and economic growth.

In view of the above illustration and in particular, discourses pertaining to the deficiencies accompanying standard Johansen and Juselius(1990) cointegration procedure has made it compelling to explore work produced by authors like Pesaran and Shin (1999) and Pesaran et al (1996). This typically relate to Autoregressive Distributed Lag (ARDL) approach to cointegration or bound testing in determining long-run relationship. Nkoro and Uko (2016) have outlined shortcomings associated with standard Johansen and Juselius procedure, but not strictly limited to the undermentioned highlights:

- Identification of cointegrating vector(s) where there are said to be multiple cointegrating relationships;
- Issue with applicability when one cointegrating vector of the different order exists;

ARDL approach is the preferred methodological procedure for this study, which is reflective of the Unit Root outcome tests and closely confirm points outlined by Nkoro and Uko (2016):

- ARDL cointegration technique is adopted notwithstanding the test outcome of variables, which are either I(0), I(1) or a combination of both, but cannot be utilised when the utilised variables are of order I(2);
- Where the Trace or Maximal Eigenvalue or the F-Statistics confirm that there is existence of a single long-run relationship amongst the variables utilised, ARDL can be applied as opposed to the Johansen and Juselius approach. The ARDL proves more robust for testing and estimating cointegration outcomes in the context of a single equation;
- Where the F-Statistics (outcome from Wald Test) proves that there is a single long-run relationship, with small ($n \leq 30$) or finite data size, we will resort to ARDL Error Correction as an efficient means of robustness, which also typify the procedure to be utilised for this study;
- The ARDL model is reparameterized into ECM in the case of outcome(s) with one cointegrating vector established amongst the utilised variables – reparameterization of outcomes also result into short-run and long-run relationship for the underlying variables;
- The ARDL cannot be applied when there exist multiple long-run relationships, instead the outcome can resort to alternative approaches like Johansen and Juselius (1990).

The use of ARDL cointegration technique as outlined encapsulate the criteria on which the technique can be utilised, with its underling benefits. As identified in the outlined objectives, ARDL as a preferred model choice is unique in dealing with model misspecification, which is characterised in the expressed equations below.

The ARDL has superior small sample properties when compared to the Johansen and Juselius (1990) Cointegration test (Pesaran and Shin, 1999). Therefore, the approach is considered to be very suitable for analyzing the underlying relationship and has been increasingly used in empirical research more recently. An ARDL representation of equation (2) and (3) can be specified as follows:

$$\mathbf{\Delta}LROE_t = \alpha_{0i} + \sum_{i=1}^{P} \alpha_{1_i} \mathbf{\Delta} LNEXR_{t-1} + \sum_{i=1}^{P} \alpha_{2_i} \mathbf{\Delta} \mathrm{LINFL}_{t-1} + \varepsilon_t \quad \text{Eq. 4}$$

$$\Delta LROA_t = \alpha_{0i} + \sum_{i=1}^{P} \alpha_1 \Delta LNEXR_{t-1} + \sum_{i=1}^{P} \alpha_2 \Delta \mathrm{LINFL}_{t-1} + \varepsilon_t \quad \text{Eq. 5}$$

Where: Δ is difference operator, p is the lag length, L is the logarithm of the selected variables and ε_t is assumed to be serially uncorrelated. $\boldsymbol{\alpha_{0i}}$ is the intercept of the equation whilst $\boldsymbol{\alpha_{1i}}$, $\boldsymbol{\alpha_{2i}}$….. $\boldsymbol{\alpha_{ni}}$ are the short-run dynamic coefficients of the model's adjustment long-run equilibrium. The model is selected based on the Akaike Information Criterion (AIC). The AIC uses the smallest possible lag length and is therefore described as the parsimonious model. Once the Cointegrating relationship is ascertained, the long run and error correction estimates of the ARDL model are obtained. The diagnostic test statistics of the selected ARDL model can be 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 the series can be specified as follows:

$$\Delta LROE_t = \alpha_{0i} + \sum_{i=1}^{P} \alpha_{1_i} \Delta LNEXR_{t-1} + \sum_{i=1}^{P} \alpha_{2_i} \Delta \mathrm{LINFL}_{t-1} + \text{ג}\mathrm{ECTt} + \varepsilon_t \quad \text{Eq. 6}$$

$$\Delta LROA_t = \alpha_{0i} + \sum_{i=1}^{P} \alpha_{1_i} \Delta LNEXR_{t-1} + \sum_{i=1}^{P} \alpha_{2_i} \Delta \mathrm{LINFL}_{t-1} + \text{ג}\mathrm{ECTt} + \varepsilon_t \quad \text{Eq. 7}$$

9

ECT=(Y_{t-1}-φV_t), *the error correction term,* $\boldsymbol{\varphi} = \sum_{i=1}^{p} \boldsymbol{\beta}$, *is the long-run parameter* **ג= (1- $\sum_{i=1}^{p} \boldsymbol{\alpha}$),** speed of adjustment parameter with a negative sign. The coefficient of the lagged error correction term (ג) is expected to be negative and statistically significant to further confirm the existence of a Cointegrating relationship.

The Bounds test to cointegration uses the F-statistic in checking the existence of the long-run equilibrium among the variables. The null hypothesis of no Cointegration (H_0:ρ_1=ρ_n=0) is verified against the alternative hypothesis of the presence of a long-run relationship, hence cointegration relationship (H_1: $\rho_1 \neq \rho_n \neq 0$). The test uses the F-statistic in comparison with the critical value bounds, which depends on the stationarity properties of the variables, thus a mixture of I(0) and I(1). This approach provides two bounds within which cointegration decisions are based. The upper bound assumes all series to be I(1), while the lower bound assumes all series are I(0).

After obtaining the computed F-statistics, if it is greater than the upper bound critical value, then a conclusion can be drawn that there is an existence of a long-run relationship among

the variables, hence cointegration. On the other hand, there will be no evidence of the existence of cointegration if the F-statistic estimate is less than the lower bound value. In a case where the Fstatistic falls between the upper and lower bound critical values, no conclusive inference can be made.

3.4.2. Optimum Lag Length Selection Criteria

Sample: 2009Q1 2020Q2

Included observations: 42

Table 2: Optimum Lag Length Table

Lag	Logl	LR	FPE	AIC	SC	HQ
0	13.46904	NA	$7.49e^{-06}$	-0.450907	-0.285414	-0.390247
1	207.8286	342.4431	$1.54e^{-09}$	-8.944221	-8.116759*	-8.640923
2	227.7220	31.26094	$1.31e^{-09}$	-9.129617	-7.640186	-8.583682
3	247.3254	27.07145	$1.17e^{-09}$	-9.301210	-7.149810	-8.512637
4	271.5255	28.80961	$8.84e^{-10}$*	-9.691690*	-6.878320	-8.660479*

*indicates lag order selection criteria: *LR: Sequential modified LR test statistic (each test at 5% level); FPE: Final Prediction Error; AIC: Akaike Information Criterion; SC: Schwarz information criteria; HQ: Hannan-Quinn Information Criterion*

The optimum lag length was determined by the Akaike Information criteria, which is four (4). Given a collection of models for the data, AIC estimates the quality of each model performance in relation to that of HQ and FPE as outlined in Table 2 above. In short, AIC provides a means for model selection. If out-of-sample prediction error is expected to differ from in-sample prediction error, cross-validation is a better estimate of model quality under the AIC framework. Besides, AIC estimates the relative amount of information lost during a given model. In estimating the amount of information lost by a model, AIC deals with the trade-off between the goodness of fit of the model and the simplicity of the model. In other words, AIC deals with both the risk of over-fitting and the risk of under-fitting.

3.5. Estimation Output

Table 3: Bounds Test Cointegration Result for Equation 3

Test Statistics	**Value**	**Lags**	**Significance Level**	**Bound Critical Values (Restricted Intercept And No Trend)***	
				I(0)	**I(1)**
			1%	2.63	3.35
F-Statistic	**9.825603**	4	**5%**	**3.1**	**3.87**
			10%	4.13	5.0

* Base on Narayan (2004) **Source**: *EVIEWS Output*

The F-statistic for the model is **9.825603** as shown in Table 3 above; it is more than the upper critical bound **(3.87)** at the 5 percent significance level. This suggests that there is a longrun convergent relationship between ROE and the chosen deterministic monetary variables. Since the model exhibits long run convergence, we therefore proceed to analyze the Static long run relationship for the model.

3.5.1. Dynamic Short-Run

The results of the short-run dynamics associated with the ARDL (3, 3, 4) are reported in Table 4 below. The coefficient of the lagged error correction term (-0.693650) is negative and statistically significant at the 1 per cent level. The negative and significant coefficient is an indication of cointegrating relationship among ROE, and the chosen explanatory Financial Sector Indicators (FSI). The magnitude of the coefficient implies that 69.4 per cent of the disequilibrium caused by previous month's shocks converges back to the long-run equilibrium in the current month.

Table 4: Short Run Dynamic Results

Variable	Coefficients	Standard Error	T-ratio
D(LROE(-1))	0.116174	0.116508	0.997135
D(LROE(-2))	0.368398	0.094973	3.878960***
D(LINFL)	0.935290	0.292644	3.196005***
D(LINFL(-1))	-0.736641	0.324023	-2.273424*
D(LINFL(-2))	0.831862	0.295244	2.817537***
D(LNEXR)	-1.886825	1.022350	-1.845575*
D(LNEXR(-1))	-2.814137	1.138081	-2.472704*
D(LNEXR(-2))	2.184114	1.151445	1.896846*
D(LNEXR(-3))	-4.704212	1.108703	-4.242987***

Diagnostic test

R-squared		**(0.785750)**	**Adjusted R-Squared**
(0.725493)	**Serial Correlation (LM Test)**		**(0.0154)**
Heteroscedasticity (0.5198)	**Normality Test (Jacque Bera)**		**(0.824437)**
Joint significance (F-Statistics)		**(0.000000)**	

Note: ****** * imply significant at the 1, 5 and 10 percent levels respectively

3.5.2. Static Long-Run Results

The existence of a long-run relationship between Return on Equity (ROE) and its explanatory variables suggests the estimation of long-run coefficients and short-run dynamic parameters. The estimation of the ARDL model is based on the Akaike Information Criterion (AIC). The static long-run results and the diagnostic test statistics of the estimated model based on short-run estimates are reported in the table below.

TABLE 5: LONG-RUN ESTIMATES BASED ON AIC- ARDL (3, 3, 4,)

Dependent Variable is LROE			
Variable	Coefficients	Standard Error	T-ratio
LROE(-1)	0.422524	0.106644	3.962016***
LROE(-2)	0.252524	0.109891	2.295233**
LROE(-3)	-0.368398	0.107569	-3.424776***
LINFL	0.935290	0.355521	2.630760**
LINFL(-1)	-1.157723	0.549621	-2.106403*
LINFL(-2)	1.568502	0.560732	2.797242**
LINFL(-3)	-0.831862	0.340507	-2.443010*
LNEXR	-1.886825	1.34716	-1.407326
LNEXR(-1)	-0.835643	1.891880	-0.441700
LNEXR(-2)	4.998251	1.952793	2.559540*
LNEXR(-3)	-6.888326	1.946515	-3.538799***
LNEXR(-4)	4.704212	1.457613	3.227341***

Note: ****** imply significant at the 1, 5 and 10 percent levels respectively.

Table 6: Bounds Test Cointegration Result for Equation 4					
Test Statistics	**Value**	**Lags**	**Significance Level**	**Bound Critical Values (Restricted Intercept And No Trend)***	
				I(0)	**I(1)**
			1%	2.63	3.35
F-Statistic	**3.064948**	4	**5%**	**3.1**	**3.87**
			10%	4.13	5.0

* Base on Narayan (2004)

The F-statistic as shown in Table 6 above for the model is **3.064948,** which is less than the upper critical bound **(3.87)** at the 5 percent significance level. This suggests that there is no longrun convergent relationship between ROA and the chosen deterministic monetary variables.

Since there is no long run convergence between the variables we cannot analyze the static long run for this equation but only the dynamic short run.

3.5.3. Dynamic Short-Run

The results of the short-run dynamics (reference to Table 8) associated with the ARDL (3, 0, 2) are reported in table BELOW. The coefficient of the lagged error correction term (-0.368305) is negative and statistically significant at the 1 per cent level. The negative and significant coefficient is an indication of the converging cointegrating relationship among ROA, and the chosen explanatory Financial Sector Indicator (FSI) variables. The magnitude of the coefficient implies that 36.83 per cent of the disequilibrium caused by previous month's shocks converges back to the long-run equilibrium in the current month.

Table 7: Short Run Dynamic Results

Variable	Coefficients	Standard Error	T-ratio
D(LROA(-1))	-0.067911	0.141417	-0.480221
D(LROA(-2))	0.296224	0.134430	2.203560*
D(LINFL)	0.452729	0.284409	1.591822
D(LINFL(-1))	-0.368305	0.100950	-3.648374***
Diagnostic test			
R-squared			**(0.383612)**
Adjusted R-Squared			**(0.318729)**
Serial Correlation (LM Test)			**(0.0757)**
Heteroscedasticity			**(0.1650)**
Normality Test (Jacque Bera)			**(0.626935)**

4. Analysis of Results

In the dynamic short run outcome, the log of Return on Equity (ROE) at lag two has the expected positive sign and exerts a statistically significant effect on current ROE at the 1 percent level, which is consistent with a-prior expectation. The basically means current ROE is 0.368398

or 36.8% is explained by the two lag periods. The findings support the recognition that a large part of ROE is normally reinvested by financial institutions.

Inflation has a positive sign on ROE and is statistically significant at the 1 percent level in the dynamic short run. This shows that inflation has a direct positive impact on ROE in the equation estimated. This means that holding all other factors constant, a 1% decline in the average price level of the Leone currency relative to the US Dollar will lead to an appreciation of ROE by 0.935290 in the dynamic short run. This is in agreement with the findings of Tan and Floros (2012), which examined the effect of inflation on bank profitability; their results exhibit that, "*there is a positive relationship between bank profitability, cost efficiency, banking sector development, stock market development and inflation in China*".

While the nominal exchange rate is only statistically significant at the 10 percent level and exerts a negative impact on the ROE, a one percent decline in the value of the Leone currency will lead to 1.886825 or approximately 2.0% fall on ROE. This also agrees with the Keshtgar et al (2020) also pursued a study to capture the influence of banks' role in the financial system in Iran. The impact of exchange rate volatility was examined as a determinant with 14 commercial banks' performance during the scoping period of 2007-2017. Utilizing the GARCH panel data method for liquidity and profitability variables they found that exchange rate has a negative and statistical significant effect on banks' capital return ratio. The study outcome also shows that exchange rate volatility as a determinant, increases the ratio of bank lending to total deposit as it results in an increase in financial gap, which ultimately leads to credit risk gap.

In the static long-run the log of return of asset (LROE) lag one has the expected sign and is statistically significant at the 1 percent level. This means that a 1 percent increase in the previous month's return of ROE will lead to an increase of 0.42 or 42% in the current month of return on assets in the static long run.

Just as in the short-run, the log of inflation has the expected positive sign and is statistically significant at the 5 percent level. This means that a 1 percent increase in the inflation level will lead to an increase in the ROE of 0.93590 or approximately 94%, holding all other factors constant. This could be that bank performance is unaffected, provided banks are able to anticipate future inflation, while also adjusting interest rate in a bid to generate higher levels of

revenue than cost to the operationalization of businesses. In the static long run the log of nominal exchange rate is negative and is statistically not significant in the first two lag. However, NEXR is positive in the second lag and is only significant at the ten percent level.

Whilst the dynamic short run equation for Return on Assets (ROA) is found to be significant at the ten percent level but only after two lag periods. Holding all other factors constant, a 1 percent increase in current ROA is explained by 0.296224 by two lag periods ago. On the other hand, a one lag period in inflation has the expected negative impact on ROA and is statistically significant at the 1 percent level. This means that a percentage point increase in inflation will lead to a fall in ROA by 0.368305 or approximately 36.8%. This agrees with BenNaceur and Ghazouani (2004) study, which utilised different country data on inflation and financial sector performance indicators and the outcome showed that inflation has a negative incidence on financial sector performance, even though there was no evidence of thresholds level after controlling for simultaneity, while ignoring biases on variables.

5. Diagnostic and Stability Tests (Post estimation Test Results)

The diagnostic tests of the estimated ARDL (3,3,4) and (3,0,2) model suggest that the models passed the tests of serial correlation, functional form misspecification and non-normal errors. There also exists no problem of Heteroscedasticity. The plots of the cumulative sum of squares of recursive residuals (CUSUMSQ) stability tests as shown in figure 3 and 5 indicate that all the coefficients of estimated models are stable over the study period as they fall within the critical bounds of the 5% significance level.

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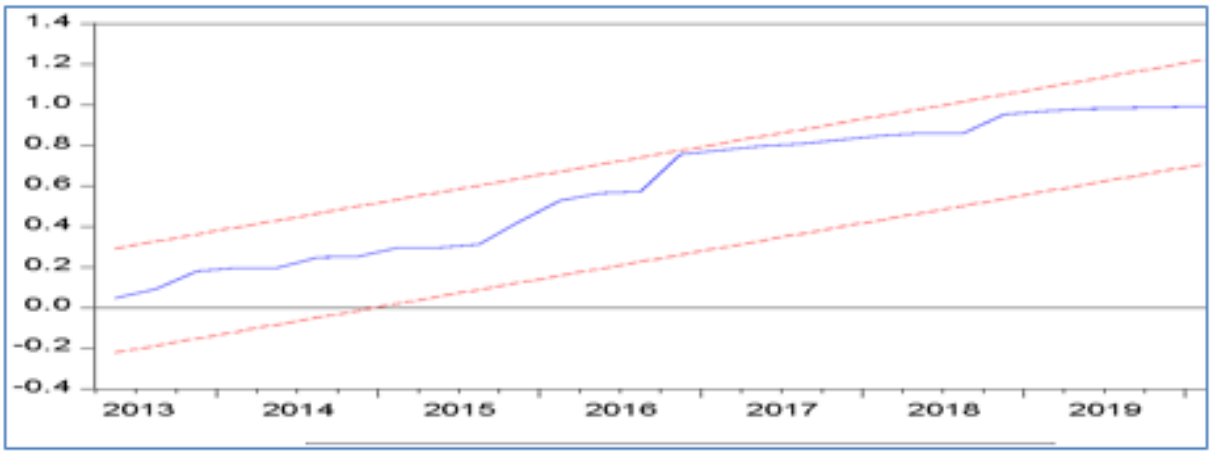
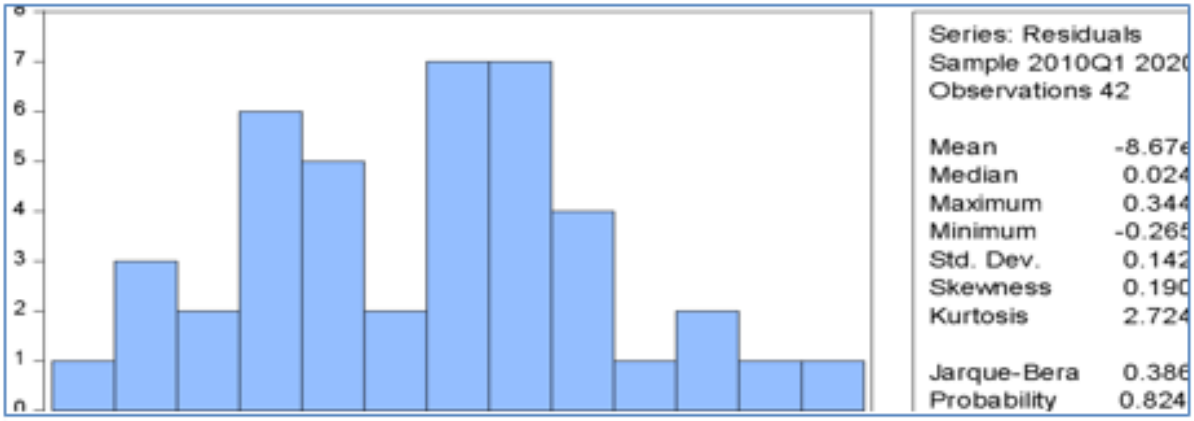
Figure 3: CUSUM SQUARE STABILITY TEST FOR ARDL (3,3,4)



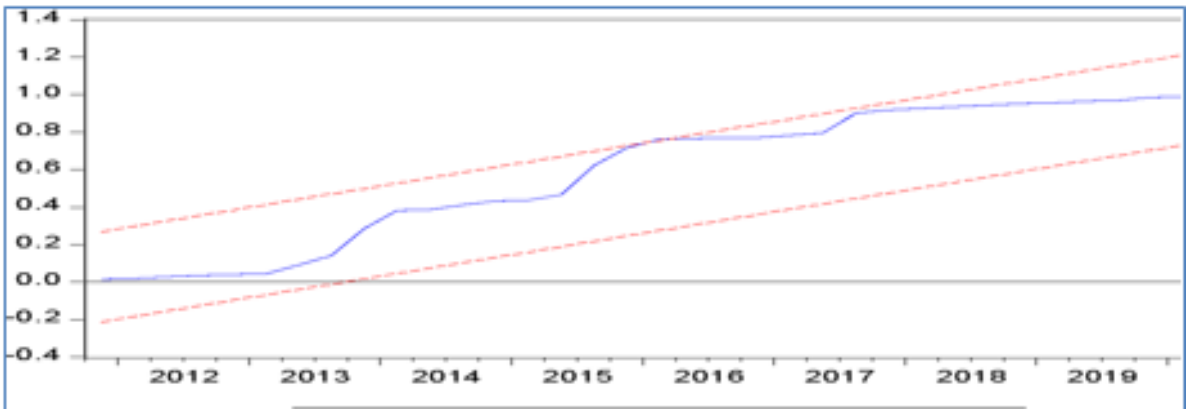
Source: *EVIEWS Output*

Figure 4: Normality Test for ARDL (3,3,4)



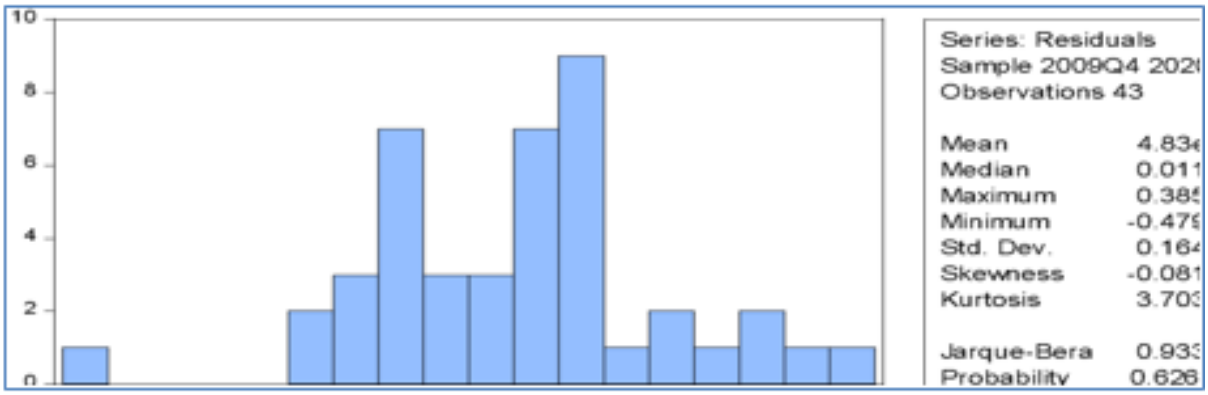
Source: *EVIEWS Output*

Figure 5: CUSUUM Test for ARDL (3,0,2)



Source: *EVIEWS Output*

Figure 6: Normality test for ARDL (3,0,2)



Source: *EVIEWS Output*

The CUSUM Squared Stability test outcome for ARDL (3,0,2), denoting the coefficient stability is said to be sitting almost on the 5% critical value line, which as already emphasised in Section 3.2, could be attributed to the problem of mismanagement the banking system experienced in the country around 2015-2017. This period was marked by huge problems of political meddling in the affairs of the two largest state-owned banks in particular and hence resulting in high levels of Non-Performing Loans (NPL) as recalled by Jackson and Jabbie (2020). In reality, this was sufficient to wreck the ROA position of the entire banking system in the country as Politically Exposed Persons (PEPS) were seen to be taking centre-stage in

manipulating tax-payers investment, which was also posing risks to the entire financial system and other macroeconomic outlook like job losses and many more.

6. Conclusion and Policy implications

Based on the empirical outcomes, inflation is said to manifest positive effect on banking sector performance, while the effect on Exchange Rate (NEXR) is negative on the overall economy. Equally, even though Inflation acts as a drag on performance, banks are normally compelled to shift resources from more productive activities in a bid to focus on profit and losses from currency inflation. This phenomenon does not hold in Sierra Leone as shown by the empirical result. One could point out that perhaps banks have factored in the distortionary effect of inflation on their profitability.

Since inflationary pressures are common phenomenon to an economic system, which normally impact the performance of commercial banks, this indicate that both the monetary authority (Bank of Sierra Leone specifically) and the government should endeavour to address exchange rate crisis as a way of harnessing the potential of the banking system to contribute meaningfully to stable economic growth. In this regard, effort must be made to build national capacity towards the production of essential goods and services, which on the whole, will reduce high demand for exchange rate in settlement of meeting huge import bills and their rapid pass-through effect to prices, which ultimately leads to inflationary pressure in the domestic economy. In addition to the on-going crises of exchange rate dominance and inflation hike in the country, stability of the banking system [as unearthed in the coefficient stability graph for ARDL (3,0,2)] can also be strengthened by ensuring robust policy measures, linked with firm legal instruments as emphasised in recent acts (BSL Act 2019 and Banking Act 2019) should serve as a deterrent to political meddling in the country's banking system. Therefore, continuous supervision of the banking system should be stepped-up by the central bank. At the same time, effort should be made to fix the country's over-reliance on imports to service domestic consumption needs (Jackson, Tamuke and Jabbie, 2019; Bangura et al, 2012). In view of the aforementioned points, the following policy recommendations are considered relevant to affirm a sound financial system stability is maintained in the Sierra Leone economy:

- Policy measures geared towards attracting foreign direct investment and strengthening export earnings through precious minerals like Iron Ore will serve as a deterrent to exchange rate crises in the country (Warburton and Jackson, 2020). This will also translate into positive outcomes for both monetary and financial system stability.
- Since inflation manifested itself positively on core FSI indicators like ROE and ROA, measures taken by the Bank of Sierra Leone to tame inflationary pressures, while caging inflation expectations as a way of stabilising the financial system. In that regard, both the BSL and the Ministry of Finance must work collaboratively to harness policy measures to curtailing inflationary pressures.
- A robust study using Panel Data Econometrics should also be pursued, where individual banks are assessed so as to give an accurate picture of their performances with respect to profits and associated risks. In this regard, the appropriateness of other FSIs should also be taken into consideration in order to assess a wider picture of systemic risks posed to the financial system, with inflation and exchange rate utilised (independently) as independent variables. This will serve as a complement to regular stress testing operations carried out in address risks to the country's financial system.

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