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Exchange Rate fluctuations and Financial Performance of Banks: Evidence from Sudan

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Abstract

This paper aims at investigating whether fluctuations in the exchange rate affect the financial performance of Sudanese banks and detecting the direction of the causal relationship relation between exchange rate and banks' performance. The study targets a total population of 37 working banks in Sudan and covers the period 2002-2017. The sample comprises of the total set of the population. The paper depends mainly on secondary data, which is collected from consolidated financial reports of commercial banks and other official publications and documents. To test the hypotheses and accuracy and validity of models and data, a set of methods of data analysis are employed, namely, Ordinary Least Squared (OLS), Generalized Least Squares (GLS), Autoregressive Distributed Lag (ARDL) and a number of Diagnostic Tests. The study documents that foreign exchange rate fluctuations, contrary to empirical research findings, have a weak negative effect on Sudanese banks' financial performance. This may be attributed to the tight economic embargo against Sudan during the period of this study, which isolates the country from the international financial system and adversely affects its ability to engage in cross border activities. Consequently, the banking sector in Sudan is insulated from the effect of international currency movements and its exposure to currency risk that may create unpredictable profits and losses is minimal. In addition, the continuous deterioration of the Sudanese Pound and the limited FDI flows to the country render the investment environment uncompetitive and incapable of attracting foreign funds and the banking system of completely domestic nature.

Keywords: exchange rate, financial performance, lending rate, liquidity, return on assets, return on equity

1. Introduction

The exchange rate measures the value of one country's currency in terms of other currencies. Exchange rate fluctuations have been of a big concern to policymakers, regulators, investors, and financial analysts since the abolishment of the fixed exchange rate system of Bretton Woods in 1971. This system is replaced by different versions of floating exchange rate systems in which the price of a currency is determined mainly by supply and demand of that currency. Given the frequent changes in supply and demand for currencies, which is influenced by numerous economic factors, this new system is responsible for exchange rate fluctuations especially in developing economies, and Sudan is not an exception. Since its independence in 1956 a number of exchange rate policies have been implemented by monetary authorities in Sudan; ranging from fixed to floating exchange rate regimes. For instance, during the period 1956-1978 the central bank of Sudan has adopted a fixed exchange rate system, whereby the exchange rate has been pegged at a fixed rate of one Sudanese pound to 2.85 US dollar. Since 1979 the country shifted to a flexible exchange rate system which has resulted in continuous exchange rate devaluations and government interventions. In the early nineteen nineties the government announced the economic liberalization policy during which market mechanism is selected as a tool for setting exchange rates. This policy was abolished three years later and replaced by establishing two windows for exchange rate dealings; commercial bank exchange rate dealings in which the exchange rate is devalued to 3 pounds /US$ and a window of the central bank in which the exchange rate is devalued to 2.15 pounds /US$. During the period 2000-2006 and as a result of foreign currency inflows associated with Sudan petroleum exports, the foreign exchange market was unified with a sole exchange rate of 2.6 Sudanese pounds for the dollar. The exchange rate, then, kept on deteriorating at an accelerating rate throughout the period 2006-2017; from 2.6 to 6.9 US dollars, with

many interventions and devaluations of currency by the central bank. For instance, in 2012 the Sudanese pound was devalued by 91% in one step, from 2.67 to 4.42 pounds for the dollar to minimize the difference between the official and parallel rates. Nevertheless the problem continues and the difference between the parallel and official exchange rates continued to escalate to reach 184 percent of the parallel rate by the end of 2017.

The importance of the exchange rate has been tremendously discussed in the literature due to its key role in enhancing the competitiveness of a country in the international economy and strengthening its inward financial stability. In addition to its vital impact on foreign investment, trade patterns, exports of goods, and trade balance exchange rate movements affect corporate performance through impacting their expected cash flows and ultimately their profitability. Given the importance of the banking system to the economy, it is very important to comprehend how the performance of this sector is affected by foreign currency fluctuations. Banking operations have significant implications for credit to the domestic economy, internal reserves, intermediation in the investment process and ultimately economic growth of countries. Banks are one of the leading actors in the foreign exchange market; they engage in import and export activities, the transactions of which must be paid for in foreign currencies. Banks also participate in foreign exchange markets as intermediaries for business organizations that operate internationally. Thus banks' financial performance which, refers to the ability to leverage operational and investment decisions and strategies to achieve profitability and financial stability, is largely affected by exchange rate fluctuations. Fluctuations in currency exchange rates could generate significant gains or losses, which in turn may produce distorted financial results and give wrong impression of the financial position of the institution concerned. Further foreign exchange rate movements could be an important source of risk for banking institutions if not well managed or hedged. Thus due to its serious implications for banking sector stability, measuring the impact of foreign exchange exposure on financial performance of commercial banks has long been a core interest of academics, professionals, bankers and policy makers. A large number of empirical studies have been carried out regarding this issue in well-developed banking markets as well as in developing settings.

This study empirically examines the impact of foreign exchange rate fluctuations on the Sudanese banking sector performance in an attempt to investigate whether these fluctuations affect the financial performance of banks and what is the type and direction of relationship between exchange rate movements and banks' financial performance. The rest of this paper is outlined as follows: Section two provides a review of the literature that researches the relationship between exchange rate volatility and banking sector performance. Section three describes the methodology used. Section four presents the empirical results. In section five the results are thoroughly discussed. Section six concludes the paper.

2. Literature Review

The banking sector contributes immensely to the economic growth of countries, especially those with limited and underdeveloped capital markets, by making funds available for investment. The importance of bank performance can be appraised at the micro and macro levels of the economy. At the micro level bank profitability is an essential prerequisite for a successful, competitive institution that is capable of offering source of funds at a lower cost. At the macro level a profitable banking sector is a buffer that resists negative economic shocks and contributes to the stability of the financial system. The relationship between bank sector performance and macroeconomic environment has always been emphasized in the literature and the lesson learned from recurring financial crises is that banking sector performance and its resilience depend on the standing of the macroeconomic environment. Macroeconomic chocks, such as great variability of economic growth, fluctuations of exchange rate and instability of inflation have led to banking crises and bankruptcies. Equally favorable or unfavorable banks performance induces expansion or contraction of credit, which in turn leads to or amplifies macroeconomic shocks. A number of theoretical models which has been developed to assess bank performance and its impact on the economy indicate that there is an interaction between banking performance, solvency risk and macroeconomic indicators, such as gross domestic product, inflation and exchange rate. Further, these studies conclude that banking crises are very costly for the economy and require decisions ranging from enacting new laws up to bailing out of banks. The substantial commitments incurred by the US government after the 2008 financial crises, in terms of loans, guarantees, and other bailout funding to address the credit and liquidity crunch and stabilize the deteriorating financial system is a good example.

Studies on foreign exchange rate fluctuations and their impact on different aspects of the economy have gained much attention in the literature. The association between foreign exchange rate variations and banking sector performance is a current issue in this respect. The relationship between bank performance and macroeconomic factors specifically GDP, interest rate, inflation and market concentration has been comprehensively researched. However, fewer empirical researches have addressed the foreign exchange exposure of banks and whether it

affects their profitability. Some of these researches discuss the influence of the exchange rate on banking sector performance within the context of internal and external determinants of banks performance. Others concentrate only on the impact of exchange rate fluctuations on performance. There seems to be a general consensus among these researches that exchange rate volatility does have an impact on banks performance. However, the direction of relationship documented between the two variables differs. For instance Chamberlain, Howe, and Popper (1997), Ngerebo (2011), Babazadeh and Farrokhnejad (2012), Acaravci and Çalim (2013), Chisepeya (2014), Osuagwu (2014), He, Fayman, and Casey (2014), Issac (2015), Lagat and Nyandema (2016) and Saona (2016) report a significant positive relationship between exchange rate fluctuations and profitability of banks. A significant negative relationship is confirmed by Taiwo and Adesola (2013), Getachew (2014), Osuagwu (2014), Offiong, Riman, and Akpan (2016), Kemisola, Ademola, Olamide, and Moses (2016), Combey and Togbenou (2017), Almaqtari, Al‐Homaidi, Tabash and Farhan (2018) and -Hasanov, Bayramli and Al-Musehel (2018). In all these studies profitability of banks is generally measured by Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). The ROA, which is the ratio of net income to total assets, measures how profitably and efficiently the management is using the firm's total assets. On the other hand, the ROE, which is the ratio of net income to total equity shows the return to shareholders on their investments. The NIM is defined as the net interest income divided by total assets and emphasizes profit earned on interest activities. The methodologies used in carrying out these researches vary, including time-series model and cross-sectional model estimated using Ordinary Least Squares (OLS), Least squares methods of fixed effects (FE) and random effects (RE) models, Dickey-Fuller (ADF) test, Error Correction Model (ECM), Generalized Method of Moments (GMM) and Autoregressive Distributed Lag Model (ARDL).

An important point to note about the results of these studies is the somewhat confusing or mixed evidence of direction of relationship between bank performance and exchange rate movements. Researches that cover developed economies show consistent outcomes, namely, a significant positive relationship between exchange rate fluctuations and profitability of banks. Conversely, some of the researches carried out in developing countries conclude that exchange rate and banks' profitability are directly related while others infer that the relation is an inverse one. These mixed results are justified on the basis of measures of bank performance used and factors which are either country specific or bank specific. As stated by Kemisola et al. (2016), the effect of exchange rate fluctuation on banks performance is materially affected by the specific measure used to judge the bank performance. According to Almaqtari et al. (2018), extent of deterioration of local currency as compared to other foreign currencies may be a reason. Razi et al. (2012) noted that magnitude of foreign direct investment may affect the extent and direction of association between exchange rare and bank profitability. Also bank size has been cited by Wong et al. (2009) as a determinant of the direction of the sigh of the relationship between foreign exchange and bank profitability.

Based on this literature review the paper formulae and tries to answer the following questions: Do fluctuations in the exchange rate affect the financial performance of Sudanese banks? What is the type of such impact if any? Is it positive or negative? What is the direction of the causal relationship relation between fluctuations in exchange rates and banks' financial performance in Sudan? To answer these questions the research tests the following hypotheses: (H0): exchange rate fluctuations have no significant impact on the banking financial performance in Sudan and (H1): exchange rate fluctuations have a significant impact on the banking financial performance in Sudan.

3. Methods

The study targets a total population of 37 working banks in Sudan and covers the period 2000-2017. The sample comprises of the total set of the population. The paper depends mainly on secondary data, which is collected from consolidated financial reports of commercial banks. Official publications and documents of the Central Bank of Sudan, the Ministry of Finance, the Statistical Bureau of Sudan and the World Bank also constitute a source of the research data. To test the hypotheses and the accuracy and validity of models and data, a set of methods of data analysis are employed, namely, Ordinary Least Squared (OLS), Maximum Likelihood Estimation (MLE), Generalized Least Squares (GLS), Autoregressive Distributed Lag(ARDL) and a number of Diagnostic Tests. Data is examined to make sure that it is good for building the model and driving reliable and verifiable results. Three models are developed to test the relation between exchange rate fluctuations and financial performance of Sudanese banks. The analysis is conducted through the use of Eviews program.

Data is tested for serial correlation, heteroscedasticity and Normality using correlogram and Q-statistics, White's Test and Jarque-Bera test respectively. Though trade-off between profit and liquidity is an important goal of any business firm, this trade-off is more prevalent for banks, so profitability and liquidity are considered by this study as important measures of banks financial performance. The econometric model of this functional

relationship between variables is given by the following equation:

$$Yi = \alpha + \beta i\, Xi + \mu \quad (1)$$

Where:

Yi = banking sector financial performance indicators.

Xi = exchange rate fluctuations and controlling variables.

α = Autonomous constant

βi = Coefficients of independent variables;

μ = Error terms.

The main model of the research is stated as follows:

$$LQTY + ROA + ROE = \alpha + \beta 1\, EXF + \beta 2 NEX + \beta 3\, FDI + \beta 4\, LDR + \mu. \quad (2)$$

Where:

LOTY: represents Banking liquidity Ratio which is calculated by dividing bank credit to the private sector (CRE) by the share of banks' deposits (DEP) (CRE/DEP %). CRE represents the general level of loans provided by the banking sector. The share of banks' deposits (DEP) provides the extent of access and deposit mobilization the banking sector offers, ROA: is the proxy for banking profitability, ROE: is the measure of the efficiency of banks to finance potential investment projects, EXRF: represents foreign exchange rate fluctuations, which is measured by the difference between parallel and official exchange rates, NEX: is the net of foreign trade (exports – imports), which is a fundamental determinant of exchange rates and balance of payment, FDI: is the foreign direct investment, LDR: represents lending rate as the cost of financing in Islamic Banking Systems.

This main model has been divided into three models.

$$ROE\ model:\ ROE = \alpha + \beta 1\, EXF + \beta 2 NEX + \beta 3\, FDI + \beta 4\, LDR + \mu \quad (3)$$

$$ROA\ model:\ ROA = \alpha + \beta 1\, EXF + \beta 2 NEX + \beta 3\, FDI + \beta 4\, LDR + \mu \quad (4)$$

$$Liquidity\ (LQTY)\ model:\ LQTY = \alpha + \beta 1\ EXF + \beta 2 NEX + \beta 3\ FDI + \beta 4\ LDR + \mu \quad (5)$$

The study uses many tools for evaluating the quality of its specification model along with a number of measurements such as stability tests, coefficient diagnostics and residual diagnostics. The results of these tests influence the chosen specification. Each test procedure involves the specification of a null hypothesis, which is the hypothesis under examination. Output from a test command consists of the sample values of one or more test statistics and their associated probability numbers (p-values). The latter indicate the probability of obtaining a test statistic whose absolute value is greater than or equal to that of the sample statistic if the null hypothesis is true. Low p-values lead to the rejection of the null hypothesis; if a p-value is less than 0.05 then the null hypothesis will be rejected.

The ARDL model is used to test for cointegration, and estimate long-run dynamics of the dependent and independent variables. The ARDL Bounds Testing methodology of Pesaran and Shin (1999) and Pesaran et al.. (2001) has been applied. The analysis involves testing that none of the variables are I(2), determining the appropriate lag structure for the model, making sure that the errors of the model are serially independent, showing that the model is dynamically stable and performing a Bound Test to see if there is evidence of a long-run relationship between the variables.

4. Results

Descriptive statistics and correlation matrix are employed by the study to provide insight into the characteristics of data in order to enable the best selection of the model. The descriptive statistics presented in Table (1) show that the seven variables exhibit positive means, and varying unconditional volatility. The skewness and high values of kurtosis coefficients imply that the distributions of these variables are characterized by peakness relative to a normal distribution. The Jarque-Bera (JB) test statistic provides p-values less than 0.05, thus the null hypothesis of normality is rejected. Table 2 presents the correlation matrix between the variables considered with their significance levels. The matrix reveals that there is no perfect collinearity that hinders the model estimation.

Table 1. Descriptive statistics

	EXRF	FDI	LDR	LQTY	NEX	ROA	ROE
Mean	0.8615	116102	8.0698	1.8347	133418	9.0720	2.8986
Median	0.08	961700	7.6	1.9832	131425	8.6022	3.0472
Maximum	5.18	314904	24	4.5807	153298	25.002	5.6447
Minimum	0.01	143271.	2.35	0.5818	123240	3.3522	1.6458
Std. Dev.	1.3077	717387.	4.3258	0.6197	717387	4.3258	0.6197
Skewness	1.4468	0.99370	0.9612	0.9030	0.9937	0.9612	0.9030
Kurtosis	3.9689	3.45475	4.4923	7.8375	3.4547	4.4923	7.8375
Jarque-Bera	24.444	10.9111	15.547	69.993	10.911	15.547	69.993
Probability	0.0000	0.00427	0.0004	0000	0.0042	0.0004	0000
Sum	54.28	731448	508.4	115.58	8.41	571.53	182.61
Sum Sq. Dev.	106.03	3.19	1160.1	23.816	3.19	1160.1	23.816
Observations	63	63	63	63	63	63	63

Researcher's Eviews output.

Table 2. Correlation matrix

	LEXRF	LFDI	LLDR	LNEX	LLQTY	LROA	LROE
LEXRF	1						
LFDI	0.71718	1					
	8.03778	-----					
LLDR	-0.1579	-0.06882	1				
	-1.2489	-0.53874	-----				
	0.2165	0.592	-----				
LNEX	-0.6335	-0.63996	-0.1640	1			
	-6.3959	-6.5047	-1.2990	-----			
	0	0	0.1988	-----			
LLQTY	0.58511	0.79982	-0.2832	-0.33817	1		
	5.63520	10.4073	-2.3069	-2.80649	-----		
	0	0	0.0245	0.0067	-----		
LROA	-0.1619	-0.07498	0.99924	-0.1589	-0.2896	1	
	-1.2819	-0.58723	200.684	-1.25705	-2.3637	-----	
	0.2047	0.5592	0	0.2135	0.0213	-----	
LROE	0.60433	0.75602	-0.2743	-0.34773	0.9594	-0.2816	1
	5.92414	9.021026	-2.2280	-2.89666	26.575	-2.292	-----
	0	0	0.0296	0.0052	0	0.0253	-----

Researcher's Eviews output.

To avoid spurious regression the paper tests the variables for stationarity before running regression. The findings of Augmented Dickey Fuller (ADF) test and Philip Peron unit root shown in Table 3 reveal that the null hypothesis of a unit root at level 5% significance level is rejected for all variables except EXRF and NEX for which the null hypothesis cannot be rejected.

Table 3. Stationary tests

Variables	ADF		PPT	
	Level	Prob. First diff.	Level	Prob. First diff.
EXRF	1	.0000	1	.0000
FDI	.0249	.0000	.6381	.0000
LDR	.0386	.0001	.0000	.0001
LQTY	.0373	.0000	.0045	.0001
NEX	.999	.0000	.6381	.0000
ROA	.0381	.0001	.0000	.0000
ROE	.0386	.0000	.0045	.00

Researcher's Eviews output.

To check specification of the estimated equations tests for auto correlation, serial correlation, normality, and heteroskedasticity are carried out for the research data. As for heteroskedasticity, the Breusch-Pagan-Godfrey tests reveal that the ROE and LQTY do not face any problem of heteroskedasticity, whereas the ROA model faces such a problem. The three models suffer serial correlation and non normality. No autocorrelation is detected in any of the three models. Results of these tests are displayed in Appendix (A). The study applies the lagged model and the ARIMA models to correct the research models from the statistical problems they undergo. The results of the tests reveal that the problems of serial correlation and heteroskedasticity have been solved in the three models. To check the stability of these models the study applies Cusum Test. From figures 1, 2 and 3 it appears that the cumulative sum of recursive residuals lies inside the area between two critical lines, which suggests that the dependent variables of the research three models are stable.

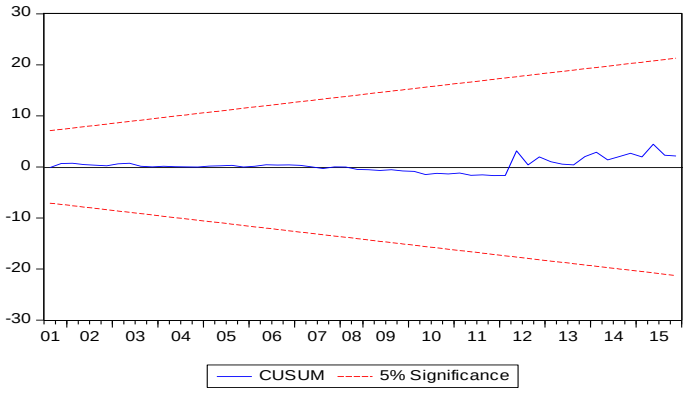

Figure 1. A Stability Test for ROE

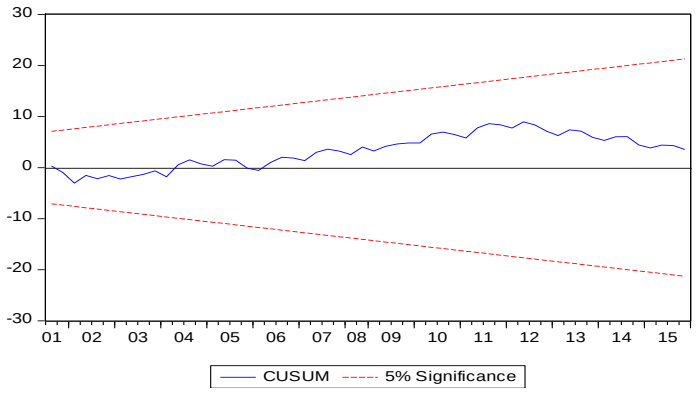

Figure 2. A Stability Test for ROA

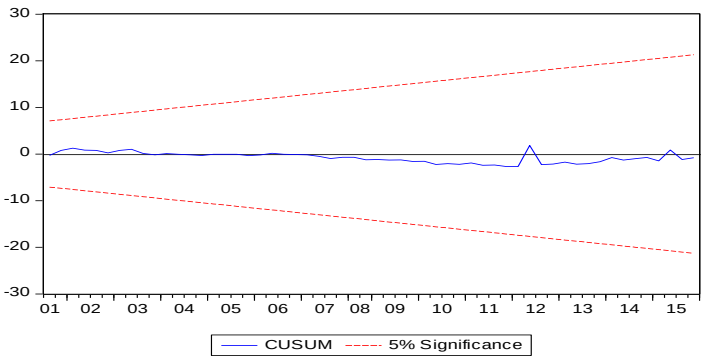

Figure 3. Stability Test for LQTY

4.1 Test of Hypotheses

The research uses the data collected to test the hypotheses that H0: $\beta_1 = 0$, $\beta 2 = 0 \ldots \beta_n = 0$, which means that the research rejects the null hypothesis of coefficients excluding intercepts are equal to zero. The study applies the t-test and F-test the results of which confirm that each coefficient does not equal zero. Thus the study concludes that all independent variables do have effect on the dependent variables. A summary of values of coefficients of regressors in each model are presented in table 4.

Table 4. Summary of values of coefficients of regressors

ROE		ROA		LQTY	
coefficient	value	coefficient	value	coefficient	value
βEXRF	-0.008116	βEXRF	-0.209639	βEXRF	-0.012880
βLDR	-0.006477	βLDR	0.327642	βLDR	-0.009824
βFDI	4.30E-08	βFDI	-0.004698	βFDI	1.66E-08
βNEX	-2.45E-07	βNEX	-0.020628	βNEX	4.19E-06

Researcher's Eviews output.

The results of the analysis of using the research three models regarding the impact of exchange rate fluctuations on the financial performance of Sudanese banks are estimated and presented in tables 5, 6 and 7.

Table 5. Coefficients estimation outputs for ROE Model Parameters

Variable	Coefficient	Standard error	t-statistic	Probability
C	-0.547550	0.224736	-2.436414	0.0182
EXRF	-0.002550	0.021660	-0.117718	0.9067
LDR	-0.076238	0.045823	-1.663757	0.1020
FDI	0.177969	0.036336	4.897895	0.0000
NEX	-4.61E-08	3.49E-06	-0.013195	0.9895

Researcher's calculations conducted with Eviews software.

Table 6. Coefficients estimation outputs for ROA Model Parameters

Variable	Coefficient	Standard error	t-statistic	Probability
C	-0.209639	46.66041	-0.004493	0.9964
EXRF	-0.004482	0.015246	-0.293969	0.7699
LDR	0.327642	0.097402	3.363805	0.0014
FDI	-0.004698	0.046057	-0.102009	0.9191
NEX	-0.020628	0.037291	-0.553158	0.5824

Researcher's calculations conducted with Eviews software.

Table 7. Coefficients estimation outputs for LQTY Model Parameters

Variable	Coefficient	Standard error	t-statistic	Probability
C	0.203023	46.38480	0.004377	0.9965
EXRF	-0.012880	0.018759	-0.686625	0.4953
LDR	-0.009824	0.004556	-2.156246	0.0355
FDI	1.66E-08	1.92E-08	0.863929	0.3914
NEX	4.19E-06	3.06E-06	1.369129	0.1766

Researcher's calculations conducted with Eviews.

From the coefficients for ROE model parameters, it can be concluded that the fluctuations of exchange rate have a negative and statistically insignificant effect on the profitability of financial performance of Sudanese banks; a coefficient of - 0.0025. The other independent variables, LDR, FDI and NEX also have small effect on the profitability as a proxy of financial performance for Sudanese bank with coefficients of -0.076, 0.178 and -4.61 respectively.

As regarding ROA model the results also indicate the negative and insignificant impact of fluctuations of exchange rate on the profitability of Sudanese banks; a one unit increase in the exchange rate will change ROA

by -0.0045 unit. Similarly the effect of FDI and NEX is a minor one. However LDR has a positive and statistically significant impact on ROA. The coefficients in table 7 as well confirm the small and negative effect of exchange rate fluctuations on the liquidity of Sudanese banks; a coefficient of -0.0129. The effect of the LDR on LQTY is the same as on ROE, negative and small; a coefficient of -0.001.

The goodness of the models is ascertained by the values of R-squared and F-statistics for each model. As shown in Appendix (B) R-squared equals 0.64682 for ROE model which means 64.7% of variation in the dependent variable is explained by the independent variables. Similarly the R-squared values for ROA model and LQTY model indicate that the models explain 60% and 83% of the financial performance of Sudanese banks respectively. The Probability of the F-statistic is equal to zero in each of the three models, which reveals that the models are statistically significant.

To examine the presence of long-run relationship between the exchange rate fluctuations and the independent variables the ARDL Model is used to test for cointegration, and estimate long-run and short-run dynamics. From the ARDL Bounds tests shown in tables 8, 9 and 10 it is clear that the null hypothesis that no long-run relationship exist between the variables is rejected which, confirms the long run relationship between the dependent and independent variables. The coefficients are (-0.916599), (-2.265046) and (-0.212618) for ROE, ROA and LQTY models respectively and the p values are equal to the zero in the three models.

Table 8. ARDL bounds test (ROE Model)

ARDL Bounds Test				
Null Hypothesis: No long-run relationships exist				
Test Statistic		Value	K	
F-statistic		8.180171	4	
Critical Value Bounds				
Significance		I0 Bound	I1 Bound	
10%		2.45	3.52	
5%		2.86	4.01	
2.5%		3.25	4.49	
1%		3.74	5.06	
Variable.	Coefficient	Std. Error	-Statistic	Prob
CointEq(-1)	-0.916599	0.137909	-6.646420	0.0000

Cointeq = LROE - (-0.0030*LEXRF + 0.0295*LFDI -0.7034*LLDR -0.0712 *LNEX + 1.1620)

Researcher's E-views Output.

Table 9. ARDL bounds test (ROA Model)

ARDL Bounds Test				
Null Hypothesis: No long-run relationships exist				
Test Statistic		Value	K	
F-statistic		30.18038	4	
Critical Value Bounds				
Significance		I0 Bound	I1 Bound	
10%		2.45	3.52	
5%		2.86	4.01	
2.5%		3.25	4.49	
1%		3.74	5.06	
Variable.	Coefficient	Std. Error	-Statistic	Prob
CointEq(-1)	-0.916599	0.137909	-6.646420	0.0000

Cointeq = Cointeq = LROA - (0.0009*LEXRF + 0.0010*LFDI + 0.8725*LLDR + 0.0045)

Researcher's E-views Output.

Table 10. ARDL bounds test (ROE Model)

ARDL Bounds Test				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	K		
F-statistic	30.18038	4		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.45	3.52		
5%	2.86	4.01		
2.5%	3.25	4.49		
1%	3.74	5.06		
Variable.	Coefficient	Std. Error	-Statistic	Prob
CointEq(-1)	-0.916599	0.137909	-6.646420	0.0000
Cointeq = LLQTY - (-0.0184*LEXRF + 0.0020*LFDI + 0.2116*LLDR + 0.0419 *LNEX-0.0100)				

Researcher's E-views Output.

5. Discussion

Though the exchange rate is expected to have a significant effect on the profitability and liquidity of banks, whether positive or negative as empirical studies report, to the contrary this paper finds that foreign exchange rate fluctuations have a weak negative effect on Sudanese banks financial performance. The same result is arrived at by using ROE, ROA or Liquidity as a measure of performance, which negates the argument that the effect of exchange rate fluctuation on banks performance is materially affected by the specific performance measure used. Country specific factors which have been cited as a reason for mixed results regarding this issue can be a justifiable rationale for the weak effect of foreign exchange rate on Sudanese banks financial performance. The country has been under tight economic embargo that continues for almost three decades. All Sudanese banks and other credit and financial institutions have suffered greatly from this embargo, which isolates them from the international financial system and hence adversely affects their ability to engage in cross border activities. As a result the banking sector in Sudan is insulated from the effect of international currency movements and its exposure to currency risk that may create unpredictable profits and losses is minimal. According to Almaqtari et al. (2018), extent of deterioration of local currency as compared to other foreign currencies could be a reason for contradicting study results. The persistent worsening of the Sudanese Pound against the US dollar leads to a continuous devaluation of the national currency and changing, unstable fiscal and financial policies. This renders the investment environment unappealing and incapable of attracting foreign capital flows. Further, the size of foreign direct investment, which is cited in the literature as a factor that may affect the extent and direction of association between exchange rate and bank profitability is clearly apparent in the case of Sudan. Though there are no administrative restrictions on foreign investment in Sudan, flows of FDI to the country are very limited; ranging between 4% to 0.9% of GDP during the ten year period 2007-2017 (https://www.ceicdata.com/en/indicator/sudan/foreign-direct-investment--of-nominal-gdp). Attracting investment is a competitive exercise which requires stable, sound macroeconomic policies, which lend confidence to take the risk inherent in investing capital. Consequently the banking system becomes of almost completely domestic nature; with transactions executed in foreign currencies being settled by customers in local currencies and foreign trade transfers being done outside the banking sector. This justifies the insignificant impact of exchange rate fluctuations on banks' profitability. Also the positive and statistically significant impact of the lending rate on ROA reflects the dependence of Sudanese banking sector on investment in local currency.

The generalizability or external validity of these results may be limited due to the lack of a fairly consistent long time series data; the study covers the period 2002-2017 using quarterly data. This may limit the generality of the results as statistical tests normally require a larger sample size to ensure a representative distribution of the population and generalization of outcomes. As well, research with a wider time span would be imperative in assessing the independent variables against the dependent variables. Further the paper uses the US dollar as the yardstick to measure foreign exchange fluctuations. Usage of other international currencies such as the Sterling Pound or the Euro to measure the Sudanese currency fluctuations, usage would confirm the impact of foreign exchange fluctuations on performance regardless of the hard currency being employed.

6. Conclusions

This study seeks to investigate whether fluctuations in exchange rate affect the financial performance of

Sudanese banks and identify the extent and direction of relationship between the exchange rate and banks' performance. Utilizing data that covers the ten-year period 2002-2017 and a sample of 37 banks, the study develops three models to examine the relationship between fluctuations in exchange rate and indicators of financial performance. The analysis involves employing a number of statistical methods to determine the impact of each of the independent variables; EXRF, FDI, LDR and NEX on the financial performance of banks in Sudan using ROA and ROE to measure profitability and deposits to loans ratio (LQTY) as a proxy for liquidity. Many statistical techniques have been applied to test the validity of data and estimate and correct the models developed by the study. Based on the results of the analysis, which are generated by Eviews 9 package and statistical values obtained through computations, the study finds an inverse insignificant relationship between fluctuations in the exchange rate and the financial performance indicators of the Sudanese banks. The other independent variables are also found to have a minor effect on Sudanese banks' performance. The findings seem to contradict what is evidenced by literature which reports significant impact of the exchange rate on the profitability and liquidity of banks, whether positive or negative. Country specific factors, extent of deterioration of local currency as compared to other foreign currencies and the size of foreign direct investment are asserted as reasons for study results. The tight economic embargo against the country that continues for almost three decades, the worsening of the Sudanese Pound against the US dollar which leads to a continuous devaluation of the national currency and the limited FDI flows render the investment environment uncompetitive and incapable of attracting foreign investors. The result being a banking system of nearly totally domestic nature, which justifies the insignificant impact of exchange rate fluctuations on banks' profitability.

The outcome of this study could be of practical significance to the monetary and fiscal authorities in Sudan. It brings to sight the pressing need for developing and setting policies to mitigate the tight effect of the economic embargo. Such policies should concentrate on controlling inflation, reducing the cost of funds, encouraging foreign investors by providing them incentives such as tariff concessions and tax reliefs to attract their transfers into the banking system. The Central Bank should strive to put measures to safeguard the value of the domestic currency such as having enough reserves in foreign currencies, encouraging exports and reducing the gap between the official and parallel rates. The real solution, however, will be in achieving the country's sustainable peace and political reform which will ensure national security and political stability required for creating an attractive investment environment.

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Appendix A. Specification and diagnostic Tests

Heteroskedasticity Test for ROE Model					
Heteroskedasticity Test: Breusch-Pagan-Godfrey					
F-statistic	0.16461	Prob. F(4,56)		0.9554	
Obs*R-squared	0.70891	Prob. Chi-Square(4)		0.9502	
Scaled explained SS	1.84528	Prob. Chi-Square(4)		0.7642	
Heteroskedasticity Test for LQTY Model					
Heteroskedasticity Test: Breusch-Pagan-Godfrey					
F-statistic	2.414638	Prob. F(4,56)		0.0595	
Obs*R-squared	8.973267	Prob. Chi-Square(4)		0.0618	
Scaled explained SS	6.250747	Prob. Chi-Square(4)		0.1812	
Heteroskedasticity Test for ROA Model					
Heteroskedasticity Test: Breusch-Pagan-Godfrey					
F-statistic	3.539370	Prob. F(4,56)		0.0121	
Obs*R-squared	12.30954	Prob. Chi-Square(4)		0.0152	
Scaled explained SS	5.541183	Prob. Chi-Square(4)		0.2361	
Serial Correlation test for ROE Model					
Breusch-Godfrey Serial Correlation LM Test:					
F-statistic	4.604549	Prob. F(2,54)		0.0142	
Obs*R-squared	8.887249	Prob. Chi-Square(2)		0.0118	
Serial correlation test for ROA Model					
Breusch-Godfrey Serial Correlation LM Test:					
F-statistic	8.767344	Prob. F(2,54)		0.0005	
Obs*R-squared	14.95241	Prob. Chi-Square(2)		0.0006	
Serial Correlation test for LQTY Model					
Breusch-Godfrey Serial Correlation LM Test:					
F-statistic	18.28067	Prob. F(2,54)	0.0000		
Obs*R-squared	24.62687	Prob. Chi-Square(2)	0.0000		

Auto Correlation test for ROE Model						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.271	0.271	4.7118	0.030
. |** |	. |** |	2	0.298	0.242	10.499	0.005
**| . |	. | . |	25	-0.268	-0.053	64.293	0.000
**| . |	. | . |	26	-0.254	-0.030	71.356	0.000
.*| . |	. | . |	27	-0.198	-0.014	75.790	0.000
.*| . |	.*| . |	28	-0.188	-0.165	79.905	0.000
Auto Correlation test for ROA Model						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.038	-0.038	0.0914	0.762
***| . |	***| . |	2	-0.462	-0.464	13.975	0.001
.*| . |	.*| . |	25	-0.147	-0.114	280.85	0.000
***| . |	. |*. |	26	-0.346	0.131	293.99	0.000
. | . |	.*| . |	27	-0.042	-0.112	294.19	0.000
. |*** |	. |*. |	28	0.399	0.091	312.76	0.000
Auto Correlation test for LQTY Model						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |**** |	. |**** |	1	0.551	0.551	19.463	0.000
. |*** |	. |** |	2	0.456	0.218	32.986	0.000
. |** |	. | . |	3	0.302	-0.022	39.027	0.000
. |** |	. |*. |	4	0.306	0.125	45.345	0.000
**| . |	. |*. |	27	-0.328	0.132	163.48	0.000
**| . |	.*| . |	28	-0.264	-0.098	171.57	0.000

Researcher's E-views Output.

Appendix B. Model's Statistics Outputs

ROE Model's Statistics Output			
R-squared	0.646821	Mean dependent var	0.455279
Adjusted R-squared	0.607579	S.D. dependent var	0.090054
S.E. of regression	0.056413	Akaike info criterion	-2.788352
Sum squared resid	0.171851	Schwarz criterion	-2.546120
Log likelihood	92.04473	Hannan-Quinn criter.	-2.693419
F-statistic	16.48283	Durbin-Watson stat	1.947246
Prob(F-statistic)	0.000000		
ROA Model's Statistics Output			
R-squared	0.608688	Mean dependent var	7.96E-06
Adjusted R-squared	0.580737	S.D. dependent var	0.307941
S.E. of regression	0.199394	Akaike info criterion	-0.308659
Sum squared resid	2.226440	Schwarz criterion	-0.135636
Log likelihood	14.41409	Hannan-Quinn criter.	-0.240850
F-statistic	21.77706	Durbin-Watson stat	2.036447
Prob(F-statistic)	0.000000		
LQTY Model Statistics Output			
R-squared	0.854435	Mean dependent var	0.238379
Adjusted R-squared	0.838261	S.D. dependent var	0.145435
S.E. of regression	0.058489	Akaike info criterion	-1.772781
Sum squared resid	0.184734	Schwarz criterion	-1.530549
Log likelihood	61.06981	Hannan-Quinn criter.	-1.677848
F-statistic	52.82798	Durbin-Watson stat	1.956215
Prob(F-statistic)	0.000000		

Researcher's calculations conducted with Eviews.