Stock Market and Exchange Rate Interactions in Nigeria: A Cointegration with Structural Break Analysis

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Abstract **: The study investigated the relationship between stock market movement and exchange rate in Nigeria using a monthly time series data for the periods 2008M1 to 2019M12. The Lee Strazicich (2003) LM unit root test and the Hatemi-J (2008) cointegration test, all allowing for the presence of more than one endogenously determined structural break, were applied to examine the stationarity and the long-run relationship of the variables respectively. The result showed the presence of two structural breaks in 2009M11 and 2011M2 following the Zt statistics of the Hatemi J. cointegration test and that there is no cointegration among the variables as reported by all the test statistics (ADF, Zt and Za) of the same cointegration test. The short-run model shows a statistically significant positive relationship between the stock market and exchange rate at lag 2 which indicates that the impact of short-run exchange rate movements of previous 2 months has a significant impact on the Nigerian stock market returns. All other variables are not influential in the short run as they returned statistically insignificant. Finally, the Pairwise Granger causality test showed no form of directional causality amongst the variables. This negates the flow and stock-oriented models.**

***Keywords*— Stock Market, Exchange Rate, Structural Breaks, Hatemi-J Cointegration, Lee Strazicich Unit Root, Flow Oriented Model, Stock Oriented Model, Granger Causality**.

I. INTRODUCTION

Government, policymakers, and industrialists have, over the years, maintained keen interests in the capital market and its dynamism. This is mostly because the capital market is seen as one of the drivers of the economy. [1] opines that one of the policy objectives of the monetary regulatory authority in each economy is the development and stability of the capital market given the financial sector's contribution towards attaining long-run growth.

According to [7], the important benefit derivable from the stock market to all economic agents is the provision of long-term, non-debt financial capital for development in all facets. The stock market plays a very prominent role in shaping a country's economic and political development. As evidenced in the recent global financial meltdown, a collapse of the stock market would trigger a financial crisis and economic recession [19].

It has been argued that the exchange rate affects economies in more ways than one. Investment determinations, international trade systems, and indeed, the financial conditions of investors can either be improved or worsened by the impact of the volatility in the exchange rate [25] [7]. [24] added that the competitiveness of firms engaged in international competition is also affected by exchange rate volatility. In general, it is believed that the exchange rate and its volatility is the determinant of economic activities globally [7].

Interests of researchers have been drawn to observing the relationship that subsists between stock market prices and exchange rates. [22], [23], [1] has said that the reason for this can be attributed to the emergence of new capital markets, liberalization of foreign capital controls, financial market globalization and implementation of flexible exchange rate regimes. [2], believed that the exchange rate and stock market prices are directly or indirectly interconnected due to trade liberalization and globalization. They went further to buttress that foreign investors invest in stock markets all over the world and as such, capital is moved across globally. To this end, it is the exchange rate that determines the benefits of these investors.

Many empirical studies have been conducted to investigate the relationship between stock market movement and the exchange rate in Nigeria and other countries. However, there is no empirical harmony among the researchers. So, it is safe to say that the contradicting results regarding the relationship between these variables beg for more research.

The study seeks to investigate the relationship between stock market movement and the exchange rate in Nigeria. Other studies, to the best of our knowledge, failed to consider the presence of structural breaks which is one of the common features in a time series data. Structural breaks, which are unexpected shifts in the data generating process, are often caused by macroeconomic shocks such as changes in interest rates, economic policies, business cycles, etc, and if ignored, can lead to serious misspecification biases in the model. Again, the scope of the study extends to December 2019. The study intends to bridge the aforementioned gaps.

II. THEORETICAL FRAMEWORK

A. *Theoretical Review*

Some theories exist which explain the links between the stock market price and exchange rate. The Flow Oriented Model was established by [5]. This model maintains that causality is expected to run from exchange rates to stock prices and that the relationship is positive. This is because movement in the exchange rate would either increase or decrease the firm stock prices depending on whether the firm is exports or imports oriented. The model claims that changes in exchange rates alter the international competitiveness of a firm as well as the balance of trade position and so it affects real income and output in a country. In the flow-oriented model, it is the changes in the exchange rate that lead to stock price changes. Exchange rate fluctuations affect both multinational and domestic firm's operations. In the case of multinational firms, a change in the rate of exchange will influence the value of firms' foreign operations via balance sheet as either profits or losses. On the other hand, the exchange rate affects the stock prices of domestic firms, if fluctuations in the exchange rate affect their input-output prices and demand for their products [2].

The Stock Oriented Model, on the other hand, was established by [3]. The model states that exchange rates are determined by the market mechanism. In other words, causality is expected to run from stock prices to exchange rates and that the relationship is negative. According to [2], a change in stock price may lead to inflows and outflows of foreign capital. An increase in the stock prices is expected to attract capital inflows, thus leading to exchange rate appreciation. While, a decrease in the prices of stock would cause a reduction in domestic investors' wealth, thus leading to lower the demand for money and interest rate, resulting to outflows of capital and hence depreciation in the exchange rate. Generally speaking, the flow-oriented and stock-oriented models of the exchange rate would suggest a causal relationship between stock market movement and exchange rate.

B. Empirical Review

[1] used a monthly data and applied [8] asymmetric cointegration analysis to examine the impact of exchange rates on stock prices in Malaysia for the period 1999 – 2014. The study shows that the variables are cointegrated and that share price has a significant impact on the exchange rate in the long-run.

In investigating the interactions between stock prices and exchange rates in Bangladesh, [23] considered monthly nominal exchange rates of US dollar, euro, Japanese yen, pound sterling, and monthly values of Dhaka Stock Exchange General Index for the period of June 2003 to March 2008. The study reveals that there is no cointegrating relationship between stock prices and exchange rates. Finally, Granger causality test shows that stock prices Granger cause exchange rates of US dollar and Japanese yen but there is no causal relationship between stock prices and exchange rates of euro and pound sterling.

[27] examined the dynamic interaction between stock prices and the exchange rate in Nigeria using co-integration and the Granger-Sim causality methodology. The study revealed a positive co-integration between stock prices and the exchange rate during the period researched. The study also revealed a bi-directional Granger causality between the variables.

[12] examined the relationship between stock prices and exchange rates in Korea. The study showed that co-integration exists between stock prices and exchange rates using the Engle-Granger two-step co-integration. The results show that domestic currency devaluation has a negative short-run effect on stock prices.

[7] in studying stock prices and exchange rates relations in Nigeria, which covered from January 2^{nd}, 2014 to May 20^{th}, 2019, observed no co-integration between the stock prices and exchange rates. They equally observed a negative correlation between the variables.

[13], the study observed a long-run relationship between exchange rate and stock price in Pakistan. However, the study showed that the exchange rate had a positive impact on stock price in the short run.

[22] used a cointegration methodology and multivariate Granger causality test to study the long run and short-run dynamics between stock prices and exchange rate in a group of Pacific Basin Countries over the period 1980 – 1998. The study provides evidence of a positive relationship between stock prices and exchange rates.

[28] used Johansen's cointegration to test for the possibility of co-integration and Granger-causality to estimate the causal relationship between the stock market index and monetary indicators (the exchange rate and M2) before and during the global financial crisis for Nigeria, using monthly data for the period 2001–2011. Results suggest the absence of a long-run relationship before and during the crisis. The Granger-causality tests show a uni-directional causality running from M2 to ASI before the crisis while during the period of the crisis there is an absence of causality between the variables.

[26] applied the autoregressive distributed lag (ARDL) model and the Error Correction Model (ECM) to investigate the existence of a long-run equilibrium relationship between stock prices and exchange rate using a monthly data from Turkey between January 2001 and September 2016. The evidence reveals that there is a strong long-run cointegration. The Granger causality test results indicate a long-run bidirectional causality between stock prices and real exchange rates and also a unidirectional causality from the real exchange rates to the stock prices in the short-run.

[2] applied the Autoregressive Distributed Lag (ARDL) model and Granger Causality tests in examining the linkage between exchange rates and the stock market in Nigeria using annual data from 1985 to 2015. The results show that the exchange rate and economic growth have a positive and statistically significant impact on the stock market in Nigeria. Granger causality results indicated that there is a unidirectional causality running from the exchange rate to the stock market.

III. DATA AND METHODOLOGY

A. Data

In estimating the relationship between exchange rate and stock market movement in Nigeria, the study employed a monthly time series data spanning from January 2008 – December 2019 totalling 144 observations for each of the variables. The All Share Index (representing the stock market), Real Effective Exchange Rate (monthly average), Broad Money Supply (M2), and Inflation Rate proxied by Consumer Price Index for the period under study are used as variables. All data used are secondary and were obtained from the 2019 quarterly statistical bulletin of the Central Bank of Nigeria.

B. Methodology

The study made considerations about the properties of the time series. All variables are in their natural log form and the model for the study is specified as;

$$\log\_ASI = \beta_0 + \beta_1 \log\_AvREER + \beta_2 \log\_M2 + \beta_3 \log\_CPI + \varepsilon_\tau \quad (1)$$

Where log_ASI = log form of All Share Index

log_AvREER = log form of Real Effective Exchange Rate (monthly average)

log_M2 = log form of Broad Money Supply (M2)

log_CPI = log form of Consumer Price Index.

β_0 = Additional factor affecting log_ASI

$\beta_1 - \beta_3$ = coefficients of log_AvREER, log_M2 and log_CPI respectively

ε_τ = error term

1) *Structural Breaks and Unit Root:* According to [10], structural change is pervasive in economic time series relationships and so can be very perilous to ignore. To determine whether to consider structural breaks, a graphic illustration of all the variables will be plotted. Again, the study will determine the presence of structural breaks using the Bai-Peron structural break test.

The study utilizes the Lee Strazicich (2003) LM unit root test proposed by [15] which allows for two structural breaks. According to them, in many economic time-series, allowing for only one structural break may be too restrictive. Lee Strazicich (2003) LM unit root test endogenously determines the location of two breaks in level and trend and tests the null of a unit root and it does not diverge in the presence of breaks under the null. The two-break LM unit root test statistic can be estimated by regression according to the LM (score) principle as follows:

$$\Delta yt = \delta'\Delta Zt + \Phi St\text{-}1 + ut, \quad (2)$$

where $St = yt - \psi x - Zt\delta$, $t = 2,..., T$; δ are coefficients of ΔZ in Eq (2); ψx is given by $y_1 - Z_1\delta$ and y_1 and Z_1 denote the first observations of yt and Zt, respectively. The LM test statistic is represented as; $\overline{\mathsf{T}}$ = t for the null hypothesis that $\phi = 0$. The location of a structural break (T_B) is endogenously determined by selecting all possible breakpoints for the minimum t-statistic as shown below:

$$\ln f\overline{\mathsf{T}}(\lambda_i) = \ln f_\lambda \overline{\mathsf{T}}(\lambda) \quad (3)$$

where $\lambda = T_B/T$.

When breaks are considered, the conventional unit root tests have low power and will likely find the series to be non-stationary when in fact, the series is stationary. According to [21], the presence of structural breaks, makes the standard Augmented Dickey-Fuller test to be biased towards the non-rejection of the null hypothesis.

2) *Hatemi-J Cointegration Test*: [21] and [14], in their respective presentations, attest to the fact that a cointegration test that does not allow for the presence of structural breaks can render the cointegration test invalid and produce spurious cointegration. To this end, the study utilizes the [11] cointegration test to check for the existence of cointegration among variables.

The [11] cointegration test makes provision for two structural breaks and it considers the following equation;

$$y_t = a + \beta' x_t + u_{t'}\ \ t = 1,2,\dots\dots,n \quad (4)$$

This equation is generalized to take into account for the effects of two structural breaks on both the intercept and the slopes (two regime shifts) as follows;

$$y_t = a_0 + a_1 D_{1t} + a_2 D_{2t} + \beta_0' x_t + \beta_1' D_{1t} x_t + \beta_2' D_{2t} x_t + u_t \quad (5)$$

Where D1t and D2t are dummy variables that are defined as;

$$D_{1t} = \begin{matrix} 0\ if\ t & \le & [n\tau_1] \\ 1\ if\ t & > & [n\tau_1] \end{matrix}$$

$$D_{2t} = \begin{matrix} 0\ if\ t & \le & [n\tau_2] \\ 1\ if\ t & > & [n\tau_2] \end{matrix}$$

with the unknown parameters, $\tau 1 \in (0, 1)$ and $\tau 2 \in (0, 1)$ signifying the relative timing of the regime change point and the bracket denotes the integer part. To test the null hypothesis of no cointegration, the ADF test is calculated by the corresponding *t*-test for the slope of $\hat{u}_{t-1}$ in a regression of $\Delta\hat{u}t$ on $\hat{u}t$-1,..., $\Delta\hat{u}_{t-k}$, where $\hat{u}_t$ signifies the estimated error term from equation (5). The $Z\alpha$ and Zt test statistics are based on the calculation of the bias-corrected first-order serial correlation coefficient estimate $\hat{P}*$, defined as

$$\hat{p} = \frac{(\hat{u}_t\hat{u}_{t+1} - \sum_{j=1}^{B} w(\frac{j}{B})\hat{\gamma}(j))}{\sum_{t=1}^{n-1}\hat{u}_t^2} \quad (6)$$

where $w\left(\frac{j}{B}\right)$is a function providing kernel weights meeting the standard conditions for spectral density estimators, *B* (itself a function of *n*) is the bandwidth number satisfying the conditions $B \to \infty$ and $B/n^5 = O(1)$, and $\hat{\gamma}(j)$ is an autocovariance function. The autocovariance function is defined by

$$\hat{\gamma}(j) = \frac{1}{n}\sum_{t=j+1}^{T}(\hat{u}_{t-j} - \hat{p}\hat{u}_{t-j-1})(\hat{u}_t - \hat{p}\hat{u}_{t-1}) \quad (7)$$

Where $\hat{p}$ is the OLS estimate of the effect (without intercept) of $\hat{u}_{t-1}$ on $\hat{u}_t$. The $Z\alpha$ and Zt test statistics are defined as;

$$Z\alpha = n(\hat{p} - 1) \quad (8)$$

and

$$Zt = \frac{(\hat{p}-1)}{\hat{\gamma}(0)+2\sum_{j=1}^{B} w(\frac{j}{B})\hat{\gamma}(j) / \sum_{1}^{n-1} \hat{u}t_t^2} \quad (9)$$

Where $\hat{\gamma}(0) + 2\sum_{j=1}^{B} w\left(\frac{j}{B}\right)\hat{\gamma}(j)$ is the long-run variance estimate of the residuals of a regression of $\hat{u}_t$ on $\hat{u}_{t-1}$. These three test statistics have nonstandard distributions. The asymptotic distribution of the ADF test statistic is identical to the distribution of the Zt statistic. The preferable test statistics would be the smallest values of these three tests across all values for τ_1 and τ_2, with $\tau_1 \in T1 = (0.15, 0.70)$ and $\tau_2 \in T2 = (0.15+\tau_1, 0.85)$. The idea is that the smallest value represents the empirical evidence against the null hypothesis (Gregory and Hansen, 1996). In other words, the lower the value, the better the model. These test statistics are defined as;

$$ADF^* = inf_{(\tau 1 \tau 2) \in T} ADF(\tau_1, \tau_2) \quad (10)$$

$$Z_t^* = inf_{(\tau 1 \tau 2) \in T} Z_t(\tau_1, \tau_2) \quad (11)$$

$$Z_\propto^* = inf_{(\tau 1 \tau 2) \in T} Z_\propto(\tau_1, \tau_2) \quad (12)$$

where T = (0.15n, 0.85n).

3) Autoregressive Distributed Lag (ARDL) Short Run Model: The study utilizes the ARDL to specify the short-run elasticities of the model. This will be done using the ordinary least square method. The short-run model can be specified as follows;

$$\Delta\log ASI_t = \beta_0 \sum_{t=1}^{q} \beta_{1t}\Delta\log ASI_{t-1} + \sum_{t=1}^{q} \beta_{2t}\Delta\log AvREER_{t-1} + \sum_{t=1}^{q} \beta_{3t}\Delta\log M2_{t-1} + \sum_{t=1}^{q} \beta_{4t}\Delta\log CPI_{t-1} + e_t \quad (13)$$

The study will check for structural stability and fitness of the model. Again, the Pairwise Granger causality test will be employed to determine whether there is a directional causality amongst the variables. The model for the causality test is as follows;

$$\Delta x_t = \sum_{i=1}^{n} \beta_i \Delta x_{t-i} + \sum_{i=1}^{n} \delta_i \Delta y_{t-1} + u_{1t} \quad (14)$$

$$\Delta_{yt} = \sum_{i=1}^{n} \alpha_i \Delta y_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta x_{t-1} + u_{2t} \quad (15)$$

The null hypothesis in Eq (14) is $\delta_i = 0$ which means Δx *does not granger cause* Δy. Similarly, the null hypothesis in Eq (15) is $\lambda_i = 0$ which means Δy *does not granger cause* Δx. The rejection or non-rejection of the null hypothesis is based on the F-statistics or the p-value. Null hypothesis is rejected if F-statistics > F-value or if p-value < 0.05.

IV. ANALYSIS AND RESULTS

The analysis for the study was run with Eviews 10 and Gauss 20 software packages. The graphical illustration of all the variables is plotted and presented in Fig. 1;

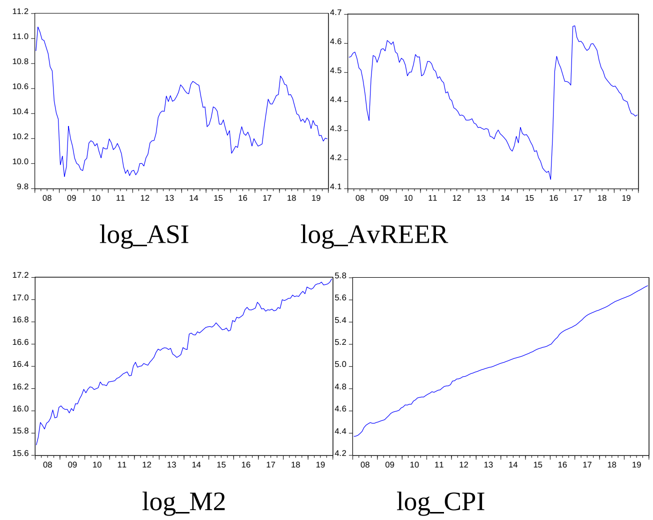

Fig 1: Graphical illustration of all the variables

Source: Authors' computation using Eviews 10

From the nature of the graphs in Fig. 1, it is pertinent to test for the presence of structural break(s). Testing for structural breaks was done using the Bai-Perron structural break test. The Bai-Perron structural break test makes provisions for 2 or more structural breaks and it is very appropriate since the graph of the variables suggests so.

Table I: Bai-Perron Structural Break Test

Variable	Structural Break(s) Identified	LWZ Criterion Value
Log_ASI	2: 2009M11, 2012M12	-2.800190
Log_AvREER	2: 2012M05, 2016M07	-5.033029
Log_M2	2: 2011M12, 2015M12	-3.710199
Log_CPI	2: 2011M12, 2016M05	-3.868345

Source: Authors' computation using Eviews 10

Table I shows that all the variables have two structural break dates as determined by the LWZ criterion.

Table II: Lee Strazicich Lm Unit Root Test

Variable	T-statistics	5% Critical Value	I(d)	Break Date(s)
Log_ASI	-3.911667	-5.561867	I(d)	2010M07 2012M11
Log_AvREER	-5.367812	-5.568333	I(d)	2015M11 2017M04
Log_M2	-6.190969	-5.555533	I(0)	2009M03 2017M02

Log _CPI	-5.059764	-5.623300	I(d)	2013M02 2016M03
ΔLog_ASI	-7.067298	-5.388027	I(1)	2009M03 2009M12
ΔLog_AvREER	-9.281058	-5.504227	I(1)	2016M01 2016M06
ΔLog_M2	-11.28934	-5.540373	I(1)	2013M11 2017M01
ΔLog_CPI	-7.552536	-5.581560	I(1)	2012M01 2016M02

Source: Authors' computation using Eviews 10

Table II reveals the result of the Lee Strazicich Unit root test which is meant to capture or make provisions for up to two structural breaks. According to the result, only log_M2 is integrated of order I(0) whereas log_ASI, log_AvREER, and log_CPI are not. Interestingly, however, all the variables become stationary at first difference. All variables are integrated of order I(1).

Table III: Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	263.1391	NA	2.90e-07	-3.701987	-3.617940	-3.667833
1	1260.394	1923.277	2.37e-13	-17.71991	-17.29967*	-17.54914*
2	1285.319	46.64659*	2.09e-13*	-17.84742*	-17.09100	-17.54003
3	1294.105	15.93905	2.32e-13	-17.74435	-16.65174	-17.30035
4	1303.916	17.24045	2.54e-13	-17.65595	-16.22715	-17.07533
S						

Source: Authors' computation using Eviews 10

The appropriate lag structure was determined for further analysis. Table III reports the lag selection criteria. The Akaike Information Criterion (AIC) shows a lag order of 2. Further analysis will be done based on lag 2.

Table IV: Hatemi-J Cointegration Test

Test Statistics	Estimated Test Value	Critical Values			Break Dates
		1%	5%	10%	
ADF	-5.975	-7.833	-7.352	-7.118	2013:2, 2014:3
Z_t	-5.967	-7.833	-7.352	-7.118	2009:11, 2011:2
$Z\alpha$	-59.611	-118.577	-104.860	-97.749	2009:10, 2011:3

Note: Critical values are obtained from Table 1 in Hatemi-J (2008).

Source: Authors' computation using Gauss 20

Table IV reports the Hatemi-J cointegration test result. With regards to the three test statistics (ADF, Z_t, and $Z\alpha$), the null hypothesis of no cointegration cannot be rejected. The results, therefore, indicate that there is no long-run relationship in the model and as such, only the short-run model will be specified. According to the test, the break dates for the Z_t statistics are 2009M11 and 2011M2 which is in tandem with the result of the Bai-Perron test for log_ASI (see Table I). The Z_t statistic is chosen following the submission of [9] that the smallest value represents the empirical evidence against the null hypothesis. These dates give credence to the 2009 global financial crises that rocked the world economically throwing most economies (Nigeria inclusive) into recession. According to [18], the NSE, which grew steadily from N35.7 billion in the year 2000 to the highest point of N2.6 trillion in 2008 receded, as the All Shares Index (ASI) shed more than 70 percent of its value between March 2008 and April 2009.

TABLE V. SHORT-RUN MODEL SPECIFICATION

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.052825	0.024113	-2.190705	0.0303
D(log_ASI(-1))	0.007166	0.086800	0.082556	0.9343
D(log_ASI(-2))	0.081417	0.083210	0.978441	0.3297
D(log_AvREER (-1))	-0.121502	0.180214	-0.674209	0.5014
D(log_AvREER (-2))	0.367371	0.177353	2.071414	0.0403
D(log_M2(-1))	-0.253581	0.209141	-1.212488	0.2275
D(log_M2(-2))	-0.100061	0.201389	-0.496855	0.6201
D(log_CPI(-1))	0.218231	1.089110	0.200376	0.8415
D(log_CPI(-2))	0.317827	1.094868	0.290288	0.7721
DUM1	0.066626	0.026387	2.524949	0.0128
DUM2	-0.015353	0.020077	-0.764703	0.4458

Source: Authors' computation using Eviews 10

The short-run model specification is as represented in Table V. The results show that only the Real Effective Exchange Rate (log_AvREER) at lag 2 is statistically significant at 5 percent critical level with a positive coefficient of 0.3674. All other variables are not influential in the short run as they are all statistically insignificant.

TABLE VI. PAIRWISE GRANGER CAUSALITY TEST

Null Hypothesis:	Obs	F-Statistic	Prob.
Dlog_AvREER does not Granger Cause Dlog_ASI	141	2.13093	0.1227
Dlog_ASI does not Granger Cause Dlog_AvREER		0.12738	0.8805
Dlog_M2 does not Granger Cause Dlog_ASI	141	1.47868	0.2316
Dlog_ASI does not Granger Cause Dlog_M2		0.51220	0.6003
Dlog_CPI does not Granger Cause Dlog_ASI	141	0.02981	0.9706
Dlog_ASI does not Granger Cause Dlog_CPI		0.17822	0.8370

Dlog_M2 does not Granger Cause Dlog_AvREER	141	1.71817	0.1833
Dlog_AvREER does not Granger Cause Dlog_M2		0.59784	0.5514
Dlog_CPI does not Granger Cause Dlog_AvREER	141	2.53728	0.0828
Dlog_AvREER does not Granger Cause Dlog_CPI		0.21753	0.8048
Dlog_CPI does not Granger Cause Dlog_M2	141	0.74501	0.4767
Dlog_M2 does not Granger Cause Dlog_CPI		0.14052	0.8690

Source: Authors' computation using Eviews 10

Table VI reports the pairwise granger causality test for the variables. The test is to establish how causation runs between the variables. Observe that all the variables have been transformed into their first difference data series before using them for the causality test. This is because it is expected that variables that are non-cointegrated and non-stationary should be transformed into their first differences before applying the Granger causality test [20]. As confirmed by [17]; [16], if not transformed, inference from the F-statistics might be spurious because the test statistics will have nonstandard distributions. So, a granger causality test will be well specified, if they are applied in a standard vector autoregressive form to differenced data for non-cointegrated variables.

Judging from the outcome of the granger causality test, the null hypothesis cannot be rejected for all the variables. The implication is that there is no causal relationship amongst all the variables. There is no causal relationship between stock market movement and the exchange rate. This result goes against the flow and stock-oriented models of the exchange rate.

Table VII: Summary of Diagnostic Test

Diagnostic Test/Stability Tests	P-value (P)	Sig. (S)	Null Hypothesis	Decision Criteria	Result
Breusch-Godfrey Serial Correlation LM Test	0.7813	0.05	No Serial Correlation	Reject H0 if P<S	No Serial Correlation
ARCH Hetero-skedasticity Test	0.7039	0.05	No Hetero-skedasticity	Reject H0 if P<S	No Hetero-skedasticity
CUSUM Stability Test					Model is Stable
CUSUMSQ Stability Test					Model is Stable

Source: Authors' compilation from Eviews 10

The results from Table VII show that there are no serial correlation and heteroskedasticity. The CUSUM and CUSUMSQ stability tests indicate that the model is stable. This is represented in Fig. 2;

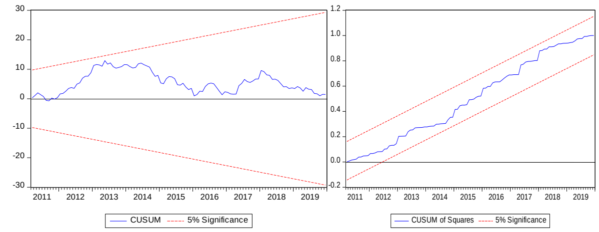

Fig 2: CUSUM and CUSUMSQ Test

Source: Authors' computation using Eviews 10

V. CONCLUSION

The study investigated the interaction between stock market movement and exchange rate in Nigeria using a monthly time series data from 2008M1 to 2019M12. From the ADF, Zt, and $Z\alpha$ statistics of the Hatemi-J cointegration, the null hypothesis of no cointegration could not be rejected meaning that there is no long-run relationship amongst the variables. However, the Zt statistics reported 2009M11 and 2011M2 to be the break dates. According to [23], there is a common belief among the investors that there is an association between exchange rates and stock prices and they are predictable based on the values of other variables. Interestingly, however, our result of no cointegration counters this belief. There is no long-term co-movement between the variables and the variables are not predictable based on the past values of other variables. This result corresponds with [23], [28], and [7].

In the short run, the study revealed that all the variables are statistically insignificant except for the real exchange rate at lag 2 which is positively significant at a 5 percent critical level with a coefficient of 0.3674. The coefficient of exchange rates with lag 2 is significant which indicates that the impact of short-run exchange rate movements of the previous 2 months has a significant impact on the Nigerian stock market returns. This result corresponds with [13].

The granger causality test showed no form of directional causality between stock market movement and exchange rate. This result corresponds with [28] which also negates the flow and stock-oriented models of [5], and [3] respectively.

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