Structural Analysis of the Effect of Exchange Rate Movement on Stock Market Performance in Nigeria

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Abstract

This paper investigates the impact and causal relationship between exchange rate movement and stock market performance in Nigeria using monthly data spanning from February 2001 to December 2017. Estimated models include pre-crisis, crisis, post-crisis, and the primary model. Johanson co-integration, IGARCH (1,1) and Pairwise Granger causality techniques were used for the analysis. The result of the co-integration test suggested the absence of a long-run relationship among the variables. The estimated IGARCH (1,1) model revealed that the exchange rate and money supply have positive impact on stock market performance. Furthermore, the paper established evidence of a one-way causality from exchange rate to stock market performance in the primary and pre-crisis models and no causality during the crisis and post-crisis periods. Thus, we recommend that the monetary authority should pay close attention to exchange rate movement, address the problem of market manipulations, and employ robust measures to protect the stock market from possible future crisis.

Keywords: Exchange rate; stock market performance; financial crisis; IGARCH model.

1.0 Introduction

Unarguably, the 2007/2008 global financial crisis remains evergreen and left an indelible print in the economic world. The financial turmoil manifested in the form of credit crunch, drastic exchange rate movement, tumbling stock market prices, and shrinking demand which leads to the loss of confidence in the financial sector. It also destabilizes the global economy and slows down the pace of economic growth and development (Njiforti, 2015). Indeed, Nigerian economy was not spared of this global economic tsunami, it effects was extremely severed in the financial sector as the exchange rate volatility impacted negatively on the stock market performance. The nominal exchange rate which stood at 101.59$/₦ before the crisis declined to 74.85$/₦ in the last quarter of 2008 and hovered at an average of 93.79$/N between March 2008 and December 2011 due to the higher demand for dollar (Onuoha and

Nwaiwu, 2016). The stock market performance follows the same direction as the all share index (ASI) nosedived to about 31,450.78 from 63,016.60 naira recorded in January 2008.

The damaging effect of the crisis prompted the Nigerian monetary authority to embark on effective reform of the stock exchange market to promote sustainable post-crisis regime. In lieu of this, several actions were taken which include the adoption of International Financial Reporting Standards (IFRS) and the proposition of Asset Management Company (AMC) among others. These measures were expected to strengthening the capital market infrastructure and arm the Nigerian stock market against contingencies such as the 2008/2009 financial crisis (Ndi, 2010). Nevertheless, the performance of the stock exchange market still depends strongly on exchange rate movement. Theoretically, the relationship between stock market performance and the exchange rate is inconclusive. This is because the flow-oriented model indicated a positive correlation between stock prices and exchange rate with a one-way causality flowing from exchange rate to stock prices while the portfolio model suggested a negative relationship with the bidirectional causality running from stock prices to exchange rate.

Similarly, the empirical studies regarding the relationship submitted contradictory results[1]. Consequent upon the contradictory findings, the paper examines the relationship as well as the direction of causality between exchange rate movement and stock market performance in Nigeria. The novelty of the paper lies in the fact that it is the first to use the post-financial crisis sample to investigate the direction of causality between stock market performance and exchange rate in Nigeria. No study known to the researchers has ever examined the direction of causality between stock prices and exchange rate in the post-crisis period in Nigeria. Also, the study probes the impact of the 2008/2009 financial crisis on stock market performance using the Integrated General Autoregressive Conditional Heteroscedasticity (IGARCH) technique proposed by Engle, Robert, and Bollerslev (1986). The choice of this model is based on the fact that it provides reliable and adequate volatility forecast compared to the ARCH model (Rupande, Muguto, and Muzindutsi, 2019)

The rest of the paper is structured as follows: Section 2 reviews the empirical literature, Section 3 discusses theoretical framework, methodology and data issues; Section 4 presents the trends analysis and empirical results. Finally, Section 5 provides the conclusion and recommendations.

[1] See summary of empirical literature review

2.0 Empirical Review

It is clear from the summary of the empirical review presented in Table 1 that the existing studies on the relationship between stock market performance and exchange rates in Nigeria are mixed and contradictory. For instance, Charles, Nicholas and Kofi (2011), Olugbenga (2012), Boako, Omane-Adjepong and Frimpong (2015), Elhendawy (2017) and, Bala and Hassan (2018) reported a one-way causality flowing from either stock market performance to exchange rate or exchange rate to stock market performance. A somewhat smaller body of the empirical studies found a two-way causal relationship and few others reported that there is no directional causality between stock market performance and exchange rate in Nigeria. It is also evident from the empirical literature that most of the studies ignored the impact of the 2007/2008 global financial turmoil in their analysis. The two studies (Aliyu, 2009 and Zubair, 2013) that considered the effect of the global financial crisis did not examine the impact of the global financial crisis on stock market performance as well as the direction of causality between Nigerian stock market performance and exchange rate in the post-crisis period. In view of the foregoing, the present study fills these gaps by investigating the impact as well as the direction of causality between exchange rate movement and stock market performance in Nigeria.

Table 1: Summary of Empirical Review

Author(s)	Period	Country	Methodology	Co-Integ.	Findings
Aliyu (2009)	February 1st, 2001 to December 31st, 2008	Nigeria	ADF and PP tests, Johansen and Juselius co-integration and Vector Error Correction Model	Yes	S ⟷ E
Charles, Nicholas and Kofi (2011)	1992 to 2005	Egypt, Ghana, Kenya, Mauritius, Nigeria, South Africa and Tunisia	ADF, PP, short-run error correction model, vector autoregressive (VAR) co-integration and impulse response analysis	Yes	S ⟵ E
Oyinlola, Adeniyi and Omisakin (2012)	January 2, 2002 to August 11, 2011	Nigeria	ADF, KPSS, Johansen and Gregory-Hansen co-integration analyses, VAR Granger causality test and Exponentional General Autoregressive Conditional Heteroskedasticity modeling	No	S ⟶ E
Olugbenga (2012)	1985:1 to 2009:4	Nigeria	ADF, PP, Johansen Cointegration Tests, Error Correction Mechanism and Granger Causality Test	Yes	S ⟵ E
Zubair (2013)	April, 2001 to December, 2011	Nigeria	ADF, PP, Johansen's co-integration and Granger-causality	No	S ⟶ E (Before Crisis) S ⋯⋯ E (During Crisis)
Fowowe (2015)	January, 2003 to December, 2013	Nigeria and South Africa	ADF, PP, KPSS, Zivot and Andrews test, Johansen co-integration test and Multivariate block Exogeneity causality test	No	S ⟵ E (Nigeria) S ⋯⋯ E (South Africa)

Boako, Omane-Adjepong and Frimpong (2015)	January 4, 2011 to July 31, 2014	Ghana	ADF, Zivot and Andrews (ZA) tests, Bayesian quantile regression (QR) technique, standard Granger and T-Y causality tests	-	S ⟵ E (cedi–dollar rate) S ⟶ E(cedi–naira rate) S ⟵ E (T-Y)
Akdogu and Birkan (2016)	January 2003 to June 2013	21 Emerging Market Economies	PP, KPSS, Granger Non-Causality Tests, Bivariate VAR(p) and Toda-Yamamoto tests	-	S ⟵ E (Colombia) S ⟶ E (Brazil, Czech Republic, Hungary, Indonesia, Korea, Malaysia, Peru and Thailand) S ⟷ E (Egypt and South Africa) S ····· E (Others)
Koperunthevy, Pratheepan and Selvamalai (2017)	January 2005 to December 2016	Sri Lanka	ADF and Ng-Perron unit root test, co-integration test and causality test	No	S ····· E
Han and Zhou (2017)	January, 2005 to December, 2012	BRICS Countries	A Mixed C-Vine Copula Model	-	Stock markets has a strong negative correlations with USD and JPY currencies after the U.S. crisis (in all BRICS countries). Stock and multivariate foreign exchange rates dependences are diverse after the European debt crisis.
Elhendawy (2017)	January, 2003 to June, 2016	Egypt	ADF, OLS, GARCH (1,1) and Granger causality test	-	S ⟶ E
Bala and Hassan (2018)	1985-2015	Nigeria	ADF, PP, Autoregressive Distributed Lag (ARDL) model and Granger Causality tests	Yes	S ⟶ E

⟷ , ⟶ (⟵) and ····· denote Bidirectional, Unidirectional and No causality respectively, S is Stock Market Performance, and E is Exchange Rates

3.1 Model Specification and Data Issues

According to Dornbusch and Fisher, (1980), exchange rate influences the behavior of the stock market. The geometric expression of the Dornbusch and Fisher' flow oriented theory is specified as follows:

$S_t = \Psi + \beta E_t + \mu_t$……..1

The study extends Equation 1 to include money supply and financial crisis dummy. The natural logarithm of the extended model is expressed below:

$\ln S_t = \Psi + \beta_1 \ln E_t + \beta_2 \ln M_t + \beta_3 \text{Dumm\_FCR} + \mu_t$.....2

where the stock market performance (measured by all share index) is represented by S_t, E_t stands for nominal exchange rates movement, M_t is money supply, d Dumm_FCR is the financial crisis dummy and μ is the stochastic term. February 2001 to February 2008 takes the

values of 0 and 1 was used for the month of March 2008 to December 2017. Ψ represents the intercept, and β_1-β_3 are the coefficient of E, M and Dumm_FCR respectively.

β_1 may be negative or positive depending on whether the Nigerian firms are dominated by import or export oriented firms. B_2 is expected to be positive while β_3 may be significantly positive, negative or insignificant. If β_3 is positive and significant, it means that Nigerian stock market performance improve on average during and after the global financial crisis in Nigeria. On the contrary, Nigerian stock market depletes if β_3 is negative and statistically significant, and the financial crisis exert no effect on the Nigerian stock market if β_3 is positive or negative and insignificant.

3.2 Techniques of Analysis

The study employs descriptive statistics for the preliminary analysis. Augmented Dickey-Fuller (ADF) and Philips Perron (PP) tests) were employed to determine the order of integration and Johanson co-integration was used to examine whether there is any long-run relationship between exchange rate movement and stock market performance in Nigeria or not. The presence of conditional heteroscedasticity and serial correlation were determined by Autoregressive Conditional Heteroscedasticity (ARCH) and Ljung-Box Q-statistic test respectively. IGARCH (1,1) model was used to investigate the impact of exchange rate movement on stock market performance in Nigeria. The choice of GARCH type model is based on the fact that it provides reliable and adequate volatility forecast compared to other volatility models (Rupande, Muguto, and Muzindutsi, 2019). The conditional variance equation of the IGARCH model is specified in Equation 3 below:

$$\sigma_t^2 = \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 + \varphi Z_t \quad \text{.....(3)}$$

where ε_{t-1}^2 is the ARCH term measured by the lag of the square residual of the mean equation and it captures the news about volatility from the previous period. σ_{t-1}^2 is the GARCH term which is the last period forecast variance, Z_t is the vector of the independent variables volatility (LOGE and LOGM) in the conditional variance equation. The sum of the coefficient of the ARCH and GARCH terms is restricted to 1 that is $\alpha + \beta = 1$.

Furthermore, the study employed Schwarz information criterion (SC) to determine the optimum lag length and used Pairwise Granger causality test to investigate the direction of causality between stock market performance and exchange rate movement in Nigeria.

3.3 Data Sources and Variable Measurement

This study obtained monthly data on stock market performance (S) measured by all share index, stock exchange market capitalization (SMC), nominal exchange rates (E)-expressed in Nigeria Naira per U.S dollar and money supply (M) from Central Bank Statistical Bulletin 2017 over the period of February 2001 to December 2017. In a bit towards achieving the study's objectives, the study structured the primary sample into three periods which are Pre-crisis, Crisis and Post-crisis periods. The pre-crisis period is assumed to begin from February 2001 and ends in February 2008, crisis period starts from March 2008 and ends in December 2011[2] while the Post-crisis period starts from January 2012 till December 2017. Besides, the study used the entire data to obtain the estimate for the primary model.

4.1 Trend Analysis and Discussion of Results

Figure 1 displays the trend of stock market performance (S) and nominal exchange rate (E) during the pre-crisis period. The graph shows that both all share index and nominal exchange rate are trending upward though nominal exchange rate was more volatile during the period. The value of nominal exchange rate which stood at 81.68$/N in December 2001 depreciated to 100.00$/N in May 2003 and then appreciated to about 98.53$/N in August 2003. Nominal exchange rate depreciated against the dollar in October 2003 and this continue until November 2007 when it appreciated to about 98.11$/N and then to 80.84$/N in February 2008. Meanwhile, the graph also suggests a significant improvement in all share index between February 2007 and February 2008 before the market plunged into a crisis.

[2]Though the global financial crisis officially begins in 2007, it effect on stock exchange market in developing economies, particularly Nigeria became noticeable in March 2008 and it continues till December 2011 despite all the efforts of policy makers in Nigeria (See Zubair, 2013 and Njiforti, 2015). However, it is important to note that some authors (such as Aliyu, 2009) believed that the effect of global financial crisis became more noticeable in Nigeria in the mid of August. In a similar vein, G-20 Economic Conference September (2013) demonstrated that the global financial crisis officially came to an end in 2013.

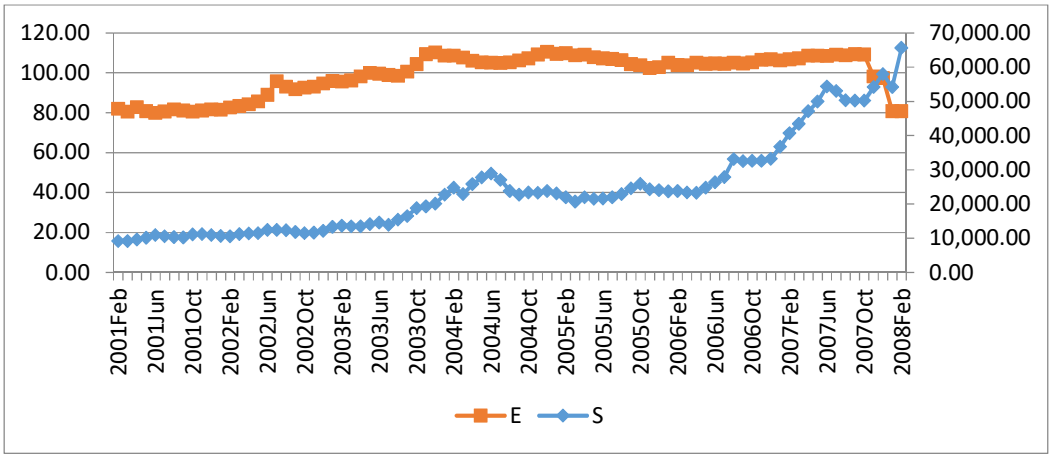

Figure 1: Trend of stock market performance and nominal exchange rate in the Pre-Financial Crisis

The trends of all share index and nominal exchange rate during the global financial crisis are presented in Figure 2. The figure reveals that all share index declined slightly in March 2008 to about 63,016.60 and nosedived to 20003.4 in November 2011 when the global financial crisis became more pronounced in Nigeria.

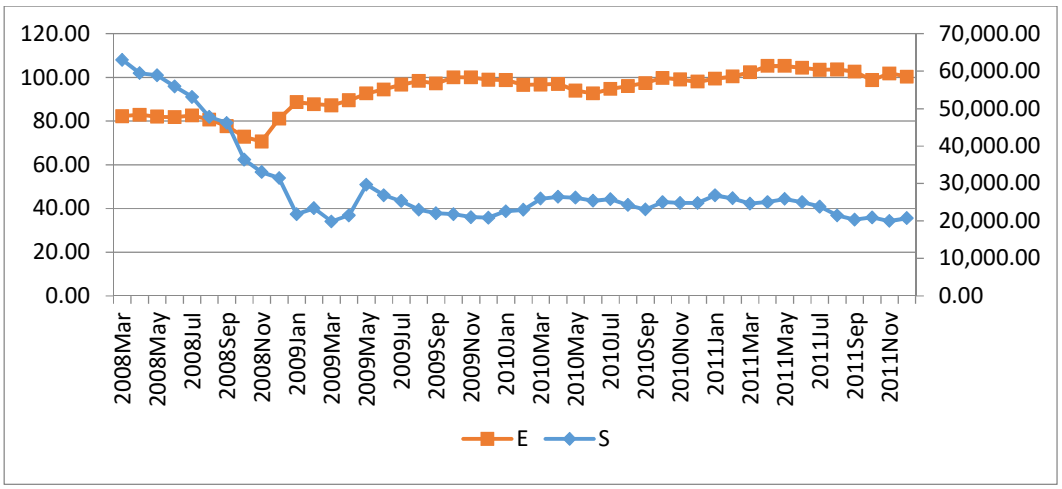

Figure 2: Trend of stock market performance and nominal exchange rate during the Financial Crisis

On the other hand, exchange rate which stands around 90.00$/N between March 2008 and April 2009 depreciated to 100.00$/₦ in November 2009. This reflects the demand pressure on the dollar relative to its supply (Njiforti, 2015). Between December 2009 and January 2011, exchange rate stabilized around 95.00$/₦ and then depreciated to 100.33$/₦ in December 2011. It can be observed from the figure that no precise relationship exists between the two variables as all share index was less responsive to exchange rate volatility.

In a similar vein, Figure 3 presents the trends of all share index and nominal exchange rate after the global financial crisis. The stock market recorded a significant improvement in its activities in January 2012 as all share index rose to about 20875.8 from 20003.4 recorded in November 2011. This is attributable to the strategies put in place by the stock exchange authority to strengthen the market and restore investor confidence (Oyinlola, Adeniyi and Omisakin, 2012). Meanwhile, all share index became more volatile since January 2012 compared to nominal exchange rate which has been very stable between February 2015 and April 2017. The trend reversed in May 2017 and increased gradually to 38243.2 in December 2017. Nominal exchange rate which stands around 100.00$/₦ in March 2016 depreciated to 160.54$/₦ in July 2016. The exchange rate appreciated to 150.87$/₦ in December 2016 and reversed back to (depreciated) 162.74 in December 2017. Obviously, the relationship between all share index and nominal exchange rate after the global financial crisis is ambiguous.

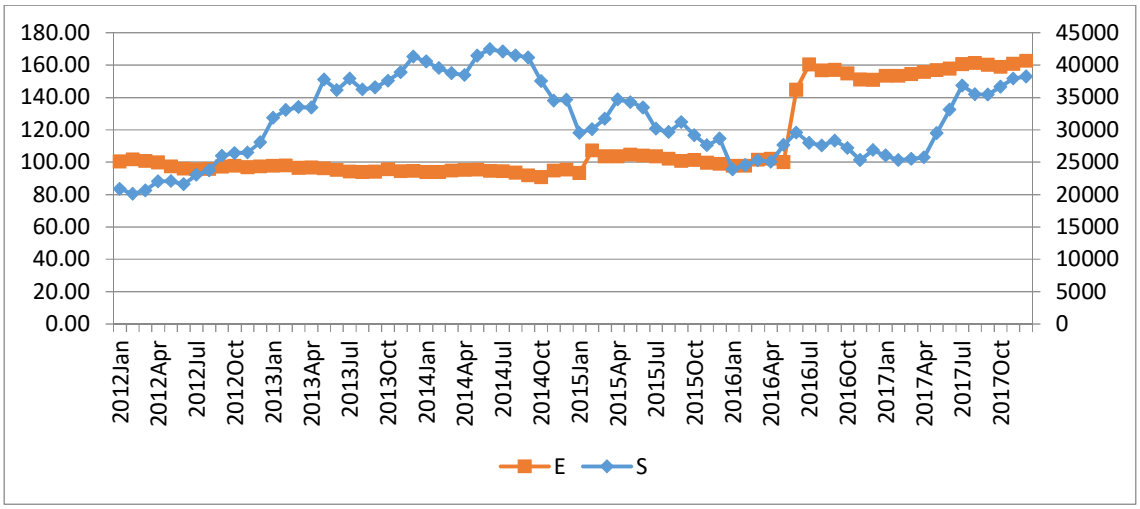

Figure 3: Trend of stock market performance and nominal exchange rate in the Post Financial Crisis

The trends of the two significant indicators of stock market performance (all share index and stock exchange market capitalization) were presented in Figure 4. It can be seen that both indicators moved in the same direction during the period considered. All share index and market capitalization proliferated between December 2005 and February 2008 and then declined slightly in March 2008 before they plummet in March 2009 as a result of the financial turmoil. According to Njiforti, (2015), the decline in all share index amounted to 33.8% between 2008 and 2009. Meanwhile, all share index trends upward in May 2009 and

fell to its lowest point of 20003.4 in November 2011. Both indicators reversed back in April 2012 and continued to trend upward until the first quarter of 2016 when they trended downward. This sudden fall is attributable to the recession which struck the Nigerian economy in 2015. In May 2017, the market recovered, and the two indicators grew by about 14.52% and 14.42% respectively. In December 2017, both indicators reached their peak of 38243.2 and 13,609.5 since the economy exited the recession.

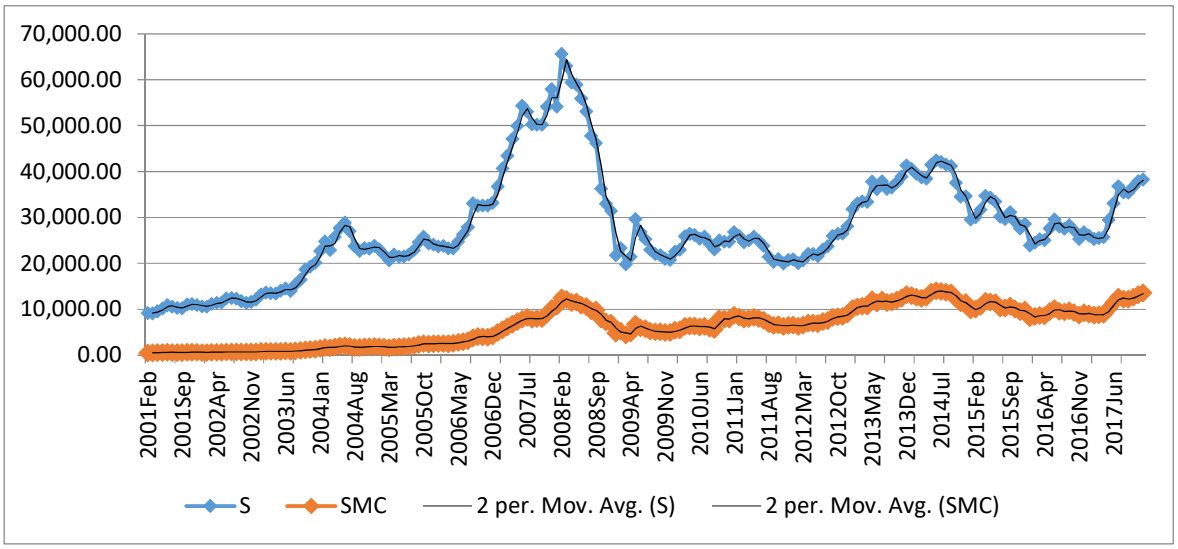

Figure 4: Trend of stock market performance and stock market capitalization from 2001 to 2017

4.2 Preliminary Statistics

Table 2 presents the summary statistic of the natural log of stock market performance (S), nominal exchange rate (E), and money supply (M) for the primary, pre-crisis, crisis and post-crisis samples. It can be observed from the table that the average value of the LOGS, LOGE, and LOGM stood at 10.15, 4.62 and 15.72 respectively. The pre-crisis sample has the lowest average value while the post-crisis sample has the highest value. This suggests that stock market appreciate more during the post-crisis period. Comparing the mean of the LOGE for the three periods, it can be seen that the mean of the LOGE for post-crisis sample is higher than the mean of pre-crisis and crisis samples. This implies that there was exchange rate depreciation during the post-crisis period.

Furthermore, the standard deviation which is a measure of volatility suggests that the LOGS, LOGE, and LOGM are not highly volatile. Looking carefully at Table 2, it can be

seen that the values of the standard deviation for the primary sample, pre-crisis, crisis, and post-crisis samples are less than one for the three variables which is an indication of moderate variation. Finally, the Jarque-Bera statistic which combines both properties of kurtosis and skewness failed to rejects the normality assumption for the LOGS (primary, pre-crisis and post-crisis sample) and LOGM (pre-crisis, crisis, and post-crisis sample). Hence, the study concludes that all the series followed a normal distribution in Nigeria.

Table 2: Descriptive Statistic

Stat	Primary Sample			Pre-Crisis Sample			Crisis Sample			Post-Crisis Sample		
	LOGS	LOGE	LOGM	LOGS	LOGE	LOGM	LOGS	LOGE	LOGM	LOGS	LOGE	LOGM
Mean	10.15	4.62	15.72	9.95	4.59	14.68	10.22	4.54	16.14	10.34	4.71	16.69
Median	10.16	4.60	16.04	10.03	4.65	14.58	10.13	4.57	16.19	10.33	4.60	16.72
Maxi.	11.09	5.09	16.99	11.09	4.71	15.76	11.05	4.67	16.40	10.66	5.09	16.99
Mini.	9.12	4.26	14.00	9.12	4.38	14.00	9.90	4.26	15.84	9.91	4.51	16.39
Std. Dev.	0.43	0.17	0.97	0.53	0.11	0.46	0.32	0.10	0.16	0.20	0.21	0.18
Skewness	-0.38	1.29	-0.39	0.27	-0.89	0.45	1.46	-1.06	-0.26	-0.23	1.01	-0.00
Kurtosis	2.98	5.11	1.64	2.13	2.25	2.36	3.91	3.26	1.83	2.02	2.15	1.63
J-Bera	5.01	94.07	20.82	3.76	13.18	4.34	18.02	8.73	3.16	3.54	14.47	5.65
Prob.	0.08	0.00	0.00	0.15	0.00	0.11	0.00	0.01	0.21	0.17	0.00	0.06
Obs.	203	203	203	85	85	85	46	46	46	72	72	72

4.3 Unit Root Tests

The results of ADF and PP unit tests reported in Table 3 rejected the null hypothesis of no unit root at level. However, the results of LOGS, LOGE and LOGM at first difference suggested that all the variables are stationary. This implies that LOGS, LOGE, and LOGM are integrated of order one, I(1).

Table 3: ADF and PP Unit Root Tests

Variables	ADF Unit Root Test		PP Unit Root Test	
	Level	First Difference	Level	First Difference
Primary Model				
LogS	-1.942468	-12.25244***	-2.149062	-12.25244***
LogE	-1.183356	-12.24513***	-1.417031	-12.22331***
LogM	-0.882484	-14.96540***	-0.729087	-15.00556***
Pre-Crisis Model				
LogS	-1.255061	-6.980846***	-1.547180	-6.978579***
LogE	1.235346	-8.808477***	1.011409	-8.880711***
LogM	-1.118123	-10.03699***	-0.996289	-10.14486***
Crisis Model				
LogS	-3.093125	-6.595609***	-2.176469	-6.616334***
LogE	-1.610037	-4.719149***	-2.017519	-4.483373***
LogM	-3.173732	-4.189305***	-3.569547**	-10.45498***
Post-Crisis Model				
LogS	-1.737168	-7.278001***	-1.845628	-7.288637***
LogE	-1.837548	-7.518194***	-1.904211	-7.522075***
LogM	-2.959715	-8.465886***	-3.158425*	-8.465886***

*** denotes significance at 1% level

4.4 Co-integration Test

Having established the stationary property of the stock market performance, nominal exchange rate, and money supply, the study employed Johanson co-integration to test the existence of the long run relationship among the variables. The results of both the Maximum Eigen-value statistics and Trace statistics presented in Table 4 revealed the absence of long-run relationship among stock market performance, nominal exchange rate, and money supply for the primary, pre-crisis, crisis and post-crisis samples at the 0.05 level of significance.

Table 4: Johanson Co-integration Test

Model	Hypothesized No. of CE(s)	Trace Statistic	Trace Statistic C.V	Maximum Eigenvalue	Max-Eigen C.V.
Primary Model	None	27.52782	29.79707	16.26581	21.13162
	At most 1	11.26201	15.49471	9.934338	14.26460
	At most 2	1.327673	3.841466	1.327673	3.841466
Pre-Crisis Model	None	20.60451	29.79707	14.61479	21.13162
	At most 1	5.989717	15.49471	5.921391	14.26460
	At most 2	0.068327	3.841466	0.068327	3.841466
Crisis Model	None	27.71347	29.79707	17.12275	21.13162
	At most 1	10.59072	15.49471	9.818233	14.26460
	At most 2	0.772486	3.841466	0.772486	3.841466
Pos-Crisis Model	None	18.91206	29.79707	12.98279	21.13162
	At most 1	5.929273	15.49471	5.582984	14.26460
	At most 2	0.346289	3.841466	0.346289	3.841466

Both Trace and Max-Eigenvalue tests indicated no co-integration at the 0.05 level of significance

4.4 IGARCH Results

The study employs ARCH test and Ljung-Box Q-statistic to ascertain the suitability of the IGARCH model for the analysis. The results of the ARCH test and Ljung-Box Q-statistic for the squared residuals in Table 5 indicated that the p-values are significant. The implication of this result is that the ARCH effect and serial correlation are present in the model, hence, the use of IGARCH model for the analysis.

Table 5: Results of ARCH test and Ljung-Box Q-statistic Model Results

Lag	ARCH Test Results			
1	F-statistic	488.2421	Prob. F(1,200)	0.0000***
	Obs*R-squared	143.2997	Prob. Chi Square(1)	0.0000***
Ljung-Box Q-Statistic Results				
	AC	**PAC**	**Q-Stat**	**Prob.**
1	0.842	0.842	146.09	0.000***
36	-0.097	-0.001	385.20	0.000***

*** and ** denote significance at 1 and 5 percent significance level respectively

The study estimated the conditional mean and variance equation of the IGARCH (1, 1) models (with and without the explanatory variable in the variance equation) using Student's T Errors which is most appropriate for heavy tailed financial series. The result of the mean equation for the three types (without LOGE and LOGM, with only LOGE and with only LOGM in the variance equation) presented in Table 6 revealed that the nominal exchange rate has positive impact on stock market performance though not statistically significant. This finding is in line with the Dornbusch and Fisher' flow oriented model which suggests a plausible relationship between nominal exchange rate stock market performance.

Table 6: Results of the IGARCH (1, 1) Specification

	IGARCH		**IGARCH (LOGE)**		**IGARCH (LOGM)**	
Mean Equation						
	Coefficient	**Prob.**	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
C	0.018102	0.0000***	0.018746	0.0000***	0.017161	0.0045***
LOGE	0.139905	0.2328	0.134062	0.2523	0.132084	0.4074
LOGM	0.045546	0.5083	0.034435	0.6213	0.043699	0.6717
FCR	-0.016104	0.0240**	-0.016356	0.0200**	-0.015523	0.0677*
Variance Equation						
α	0.110735	0.0004***	0.114876	0.0003***	0.119270	0.0111**
β	0.889265	0.0000***	0.885124	0.0000***	0.880730	0.0000***
LOGE	-	-	-0.001511	0.6739	-	-
LOGM	-	-	-	-	0.009843	0.1802
α+ β	1		1		1	
Post Estimation Tests						
Q^2 Test (1)	0.7894 (0.374)		0.8151 (0.367)		0.5354 (0.464)	
Q^2 Test (36)	26.777 (0.868)		26.402 (0.879)		20.760 (0.980)	
ARCH LM test(1)	0.771169 (0.3809)		0.796403 (0.3732)		0.522459 (0.4706)	
Durbin-Watson stat	1.735081		1.737153		1.736450	

***, **, and * denotes significance at 1, 5 and 10 percent level in Nigeria. LOGE and LOGM are the conditional volatility of exchange rate and money supply respectively.

Further, the result indicated an insignificant positive relationship between money supply and stock market performance and a significant negative relationship between global financial crisis and the stock market in all the models. The coefficient of the global financial crisis suggests that the Nigerian stock market performance decline on average by 0.02 during and after the global financial crisis. The result of the variance equation for the three models suggested that all the parameters except for exchange rate and money supply volatility (LOGE and LOGM) are significance at 1 or 5 percent level of significance. By implication, the current volatility is only explainable by the past shocks (α) and previous period forecast variance (β), with previous period forecast variance exerting more impact on current

volatility. As expected, the sum of the coefficient of the ARCH and GARCH terms is 1 indicating that all future horizons are affected by the shock to the series.

The diagnostic tests revealed that the estimated models are reliable as the results of the Q^2-statistic test, ARCH LM test, and Durbin-Watson stat revealed the absence of serial correlation and ARCH effect in the models.

4.5 Granger Causality Test

The study applied Pairwise Granger causality test to the first difference of the natural log of stock market performance, nominal exchange rate, and money supply using the lag length suggested by Schwarz information criterion[3] to establish the direction of causality among the series. The results presented in Table 7 revealed the unidirectional causality running from nominal exchange rate to stock market performance in the primary and pre-crisis models. By implication, variations in stock market performance were driven by exchange rate movement in the primary and pre-crisis periods. This finding contradicted Zubair (2013); however, it is in line with the prediction of Dornbush and Fisher (1980) flow model which indicated a unidirectional causality running from exchange rates to stock prices. Besides, the result partially corroborates the finding of Aliyu (2009), and Bala and Hassan (2018) who reported a unidirectional causality running from exchange rate to stock market performance.

Table 5: Pairwise Granger Causality Test

Null Hypothesis	F-Statistic	Prob.	Conclusion
Primary Model			
LOGE ↮ LOGS	5.40160	0.0211**	Unidirectional
LOGS ↮ LOGE	0.25959	0.6110	Causality
LOGM ↮ LOGS	2.53692	0.1128	No Causality
LOGM ↮ LOGM	0.07639	0.7825	
LOGM ↮ LOGE	0.64585	0.4226	No Causality
LOGE ↮ LOGM	0.11359	0.7364	
Pre-Crisis Model			
LOGE ↮ LOGS	7.03414	0.0096***	Unidirectional
LOGS ↮ LOGE	0.03136	0.8599	Causality
LOGM ↮ LOGS	0.00044	0.9833	No Causality
LOGS ↮ LOGM	1.01823	0.3160	
LOGM ↮ LOGE	2.77310	0.0998*	Unidirectional
LOGE ↮ LOGM	0.70533	0.4035	Causality
Crisis Model			
LOGE ↮ LOGS	1.05682	0.3100	No Causality
LOGS ↮ LOGE	0.09028	0.7653	
LOGM ↮ LOGS	1.93206	0.1720	No Causality
LOGS ↮ LOGM	0.06121	0.8058	

[3] Schwarz information criterion suggested 1 as lag length for the four models

LOGM ⟷ LOGE	0.14381	0.7065	No Causality
LOGE ⟷ LOGM	0.24606	0.6225	
Post-Crisis Model			
LOGE ⟷ LOGS	0.87629	0.3526	No Causality
LOGS ⟷ LOGE	0.56027	0.4568	
LOGM ⟷ LOGS	6.37175	0.0140**	Unidirectional
LOGS ⟷ LOGM	0.33742	0.5633	Causality
LOGM ⟷ LOGE	0.01136	0.9154	No Causality
LOGE ⟷ LOGM	0.27890	0.5992	

***, ** and * denote significance at 1, 5 and 10 percent significance level

Contrariwise, the results failed to reject the null hypothesis of no causal relationship between nominal exchange rate movement and stock market performance in the crisis and post-crisis models. In other words, the result revealed no evidence of causality between nominal exchange rate and stock market performance. This implies that the activities on the stock exchange market are not guided by the fundamentals (rules and regulations) of the Nigerian capital market during and after the global financial crisis. The nominal foreign exchange rate suffers from speculative attack, and the indicators of stock exchange market performance were influenced by market manipulation, insider trading, circular or triangular trade, front-running among others. Meanwhile, the finding lent credence to the work of Zubair (2013) who reported no causation between nominal exchange rate and stock market performance during the crisis. However, it contradicted the work of Aliyu (2009) who confirmed a strong directional causality between exchange rate and stock prices during the crisis. The conflicting result may be as a result of the difference in the method of analysis.

5 Conclusions

This paper used monthly data from February 2001 to December 2017 to investigate the impact and causal relationship between nominal exchange rate movement and stock market performance before, during and after the global financial crisis. IGARCH (1,1) model and Granger causality test were used to determine the relationship and direction of causality between nominal exchange rate movement and stock market performance. The estimated IGARCH (1,1) model revealed that nominal exchange rate and money supply have positive impact on stock market performance and the current volatility in the stock market is only explainable by the past shocks and previous period volatility. The paper established strong evidence of a one-way causality running from nominal exchange rate to stock market performance in the primary and pre-crisis models. Furthermore, the result revealed no evidence of causality between nominal exchange rate and stock market performance in the

crisis and post-crisis periods. Based on the foregoing, it is imperative for Nigerian market authority to pay close attention to exchange rate movement and employs robust measures to protect the stock market against fraud, market manipulations and other abusive practices. Finally, Nigerian market authorities should embark on effective monitoring of all transactions and ensure members comply with the rules and regulations of the market.

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