

Exchange Rate and Stock Market Interactions: Evidence from Nigeria

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Abstract

This study examines the linkage between exchange rates and stock market in Nigeria using annual data from 1985 to 2015. In conducting the analysis, this study utilized Autoregressive Distributed Lag (ARDL) model and Granger Causality tests. Exchange rate, economic growth, money supply and stock market (i.e., all share indexes) were captured in the model. The results show that exchange rate and economic growth have positive and statistically significant impact on stock market in Nigeria, while money supply has negative and statistically significant influence on stock market over the study period. Granger causality results indicated that there is unidirectional causality running from exchange rate to stock market. Similarly, there is unidirectional causality running from stock market to money supply. It is also indicating no evidence of causality runs from economic growth to stock market and vice versa. This study recommends the following: there is the need for policymakers to ensure effective implementation of existing monetary policy instruments and device strong way of harmonizing monetary and fiscal policies in order to maintain stable exchange rate and avoid structural break that affect the whole system including the stock market. There is also the need for Central Bank of Nigeria to reduce the volume of money in circulation, this will help to reduce the price of goods and services in the economy vis-à-vis boosting the savings and increase the levels of investment in the long run.

Keywords: Exchange rate; Stock market; Economic growth; Money supply; ARDL

Introduction

Exchange rate stability and stock market growth are the twin economic objectives that every country needs to achieve. This is because the financial position of every economy being it developed or developing can be assessed from its exchange rate stability. According to Hassan et al. [1] a very strong exchange rate is a signal that shows strong and viable economy it is. While on the other hand a very weak currency is a reflection of a very vulnerable and weak economy. Exchange rate instability has real economic shocks because it negatively affects prices level, firms' profits and even the entire activity in an economy. Similarly, stock market plays crucial role in economic development of every nation. Stock market serves as a transmission mechanism upon which savings are mobilized and adequately distributed across the economic sectors with the view to realize inclusive growth. In addition to the foregoing stock market perform the following functions: it boosts investors' confidence in both financial institutions and even the entire economy; it indicates strength and viability of the productive sectors; and it facilitates capital allocation, investment and provides firms with Ease Avenue to have access to adequate and needed capital.

Exchange rate and stock market price are interconnected directly or indirectly, because today, world is turning into a global village due to trade liberalization and globalization. For instance, foreign investors are busy investing their capital in the stock markets world over. In this process international investment is booming rapidly and capital is moving across all over the world. The benefits of these investors are being determined by foreign exchange rate. Moreover, instability in the exchange rate may bring about uncertainty or otherwise in these investors. Thus, exchange rate is the important determinant of stock market fluctuations [2].

In Nigeria, the value of naira experienced high degree of volatility recently. For example, statistical records have shown that from 2006 to 2008 the value of naira to US\$ was ₦125, but further depreciated from ₦150.3 in 2010 to average of ₦153.90, ₦156.81 and ₦305.25 per US\$ dollar in 2011, 2013 and 2017, respectively. In the same vain the stock

market moves so strongly on the same direction with the currency exchange rate. Statistically, stock market collapsed by about 70% between 2008-2009. Additionally, the All Share Index (ASI) as measure of stock market performance has persistently declined from 65,652.38 in 2008 to less than 30,000.00 points in 2012. It however, increases from 31,853.19 to 41,210.10 points between 2013 and 2014, after which in continuously declined to less than 31,853.19 points from 2015 to date.

Empirically, studies on the relationship between exchange rate and stock market prices in Nigeria were conducted by Asaola and Ogunmuyiwa [3], Lawal and Ijirshar [4] and Zubair [5] and they revealed different results. Asaola and Ogunmuyiwa [3] and Lawal and Ijirshar [4] in their studies reveal that there is unidirectional causality running from exchange rate to stock market. While Zubair [5] revealed that there is no evidence of causality between exchange rate and stock market prices in Nigeria. Consequently, these inconsistent results and consideration of the contributions of foreign exchange market and stock market to economic development are among the reasons for the need to further conduct similar study on the exchange rate-stock market nexus in Nigeria. Previous studies on the relations between exchange rate and stock market performance in Nigeria have not been able to employ the use of rigorous econometrics analysis and that no existing studies on the topic have adopted the recently developed Autoregressive Distributed Lag Model (ARDL) bounds test approach to the best knowledge of the authors. This is also another reason justify the relevance of conducting this study in Nigeria as well as to examine the direction of the relationship between exchange rate and

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stock market performance in order to provide additional empirical evidence on the nexus between the variables under estimation. This study however, seeks to contribute to discussion on the exchange rate-stock market associations which empirically contains the missing link that need to be bridged.

The objective of this study is to examine the relationship between exchange rate and stock market in Nigeria. To achieve the objective, this study is structured into five sections including this introduction. Section two and three contains review of related literature and methodology. While section four and five comprises findings of this study and conclusion and recommendations correspondingly.

Review of Related Literature

There are basically two theories that explain the interactions between exchange rate and stock market prices. These are flow oriented model and stock oriented model. In flow oriented model, it is the changes in exchange rate that lead to stock prices 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. Long as profits or losses declared, the firm's stock prices will change. On the other hand, exchange rate affects the stock prices of domestic firms, if fluctuations in exchange rate affect their input-output prices and demand for their products [6]. More so, the causality is expected to run from exchange rates to stock prices. This is because movement in exchange rate would either increase or decrease the firm stock prices depending on whether the firm is exports or imports oriented.

Stock oriented model also known as portfolio adjustment approach is of the opinion that, it is the stock prices that cause exchange rate changes. 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 the 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 exchange rate [7]. Empirically, Abdallah and Murinda [8], Aydemir and Demirham [9] reveal that it is the exchange rates that granger cause stock prices. Richard et al. [10], Kutty [11] and Alagidede et al. [12] reported that it is the stock prices that granger cause exchange rate. Additionally, bidirectional evidence has been revealed from the works of Rjoub [13], Umoru and Asekome [14] and Khan and Ali [2], while Rahman and Uddin [15], Zia and Rahman [16] and Zubair [5] shows no evidence of causality.

Empirical studies on the relations between exchange rate and stock market were conducted both within and outside the country. For instance, Abdallah and Murinda [8] examined the stock price-exchange rate interaction of four countries; India, Korea, Pakistan and Philippine. They applied Granger causality and co-integration approaches. Their study indicated a unidirectional causality running from exchange rate to stock market in all the countries under study accept Philippine.

Aydamir and Demirham [9] examined the impact of stock price on exchange rate in Turkey using daily data from 23rd of February 2001 to 11th of January, 2008. Their study found that there exists bidirectional causality between stock market indices and exchange rate. Employing Granger causality, Kutty [11] analyzed the connection between exchange rate and stock market prices in Mexico. He used weekly data

from the 1st of January, 1989 to last week of December, 2006. The result shows the evidence of causality between stock market and exchange rate and that no evidence of long run relationship.

Kose et al. [6] assessed the relationship between stock price and exchange rate in the Turkey financial market using daily data from 23rd of February, 2001 to 4th of November, 2009. Their result shows that there is unidirectional causality running from stock price to exchange rate. They recommended that government should take into consideration the previous values of stock indices when making exchange rate policy.

Alagidede et al. [12] examines the nature and direction of causality between stock markets and foreign exchange markets in Austria, Canada, Japan, Switzerland and United Kingdom. They employed monthly data, Johnson co-integration and Granger causality test in the analysis. Their results indicated that, there is no long run relationship and that causality runs from exchange rate to stock market in Canada, Switzerland and United Kingdom. Rjoub [13] investigated the relationship between stock market and exchange rate in Turkey using monthly data from 2000:08 to 2009:08. He applied co-integration and Granger causality test techniques and the result shows evidence of co-integration between the series. More so, Granger causality test reveals the existence of bidirectional relationship [14-16].

Hussein and Mgamal [17] examined the relationship among the inflation, interest rate, exchange rate and stock market prices in Kingdom of Saudi Arabia and United Arab Emirate (UAE) using monthly data from 2008:1 to 2009:12. The study reveals that exchange rate is negatively related to stock market prices while no evidence of relationship exist between interest and inflation.

Equally, in Nigeria, Yaya and Shittu [18] examined the impact of inflation and exchange rate on conditional stock market volatility in Nigeria. They applied Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Quadratic GARCH models in the analysis. Monthly series data spanning from 1991 to 2008 were used. Their analysis proved that inflation and exchange rates exert significant influence on conditional stock market volatility. They suggested that, the findings are of great significant to policy makers, stock brokers and investors operating within the Nigerian economy.

Asaolu and Ogunmuyiwa [3] tested whether macroeconomic variables exert positive impact or otherwise on the stock market movement in Nigeria. Granger causality test, co-integration and Error Correction Model (ECM) were applied in examining the series spanning from 1986 to 2007. The variables of their choice are average share price, external debt, interest rate, fiscal deficit, exchange rate, foreign capital inflow, investment, industrial output and inflation rate. The study indicated the existence of co-integration among the series under control. The findings also show that there is unidirectional causality running from exchange rate to average share price.

Osamwonyi and Osagie [19] applied VECM in analyzing the connection among interest rate, inflation rate, exchange rate, fiscal deficit, GDP, money supply and stock market index in Nigeria. Annual time series data were employed from 1975 to 2005. They found that macroeconomic variables affect stock market index in Nigeria. For better robust growth of the market, the study suggested the application of suitable policy measures in the economy.

Zubair [5] assessed the stock market-exchange rate nexus in Nigeria using monthly data for the period 2001 to 2011. The study used stock market index, exchange rate and money supply as variables in the model. The study further used Johnsen co-integration and Granger

causality as techniques of data analysis. The study reveals that there is no long run relationship among the variables. The Granger causality test shows that no evidence of causality between exchange rate and stock market and that there is unidirectional causality from money supply to stock market index.

Esther and Emeno [20] examined the nexus among inflation rates, financial openness, exchange rates and stock market returns volatility in Nigeria from 1985 to 2012. The study applied ARCH and GARCH models. They found that inflation has negative and statistically significant impact on stock market returns and exchange rate has positive and statistically significant influence on stock returns. The study recommends the need for the policymakers to employ strong and suitable policy measures which include credit control, cutting the cost of governance, increase production and anti-inflationary budgetary policy.

From the review of empirical literature, one can see that there exist methodological and time period gaps. This is due to the fact that most empirical studies reviewed used VECM and Granger causality and non-used ARDL which is perceived to give more robust and reliable outcome. Similar in term of time none of the study covered the period up to year 2015 a year characterized by economic recession and downward swing in the oil price that has great impact on the Nigerian economy.

Methodology

To examine the relationship among the variables, this study applied Autoregressive Distributed Lag (ARDL) Model for estimation. Prior to the model estimation, the unit root test was conducted so as to know the order of integrations of the variables. The methods used in the process were augmented dickey-fuller (ADF) and Phillips-Perron (P-P). This study also used annual data spanning from 1985 to 2015. This is the period for which all the data of the variables under assessment are available. The data is sourced from statistical Bulletin a publication of Central Bank of Nigeria and World Development Indicators, a publication of World Bank. The variables captured in the equation were stock market proxies by All Share Index (ASI), Exchange Rate (EXR), economic growth proxies by Gross Domestic Product (GDP) and Money Supply (M2).

Model specification

This study used ARDL approach developed by Pesaran et al. [21] to examine the relationships among the variables in the system equation. The justifications of choosing this approach are: first ARDL can be applied irrespective of whether the variables are stationary at level value $I(0)$ or after first difference $I(1)$ or combination of both (i.e., $I(0)$ or $I(1)$). Second, it can generate robust and reliable results whether the sample size is small or large. Finally, it produces long run and short run results at a time Pesaran et al. [21]. The ARDL model is given as:

$$\Delta LASI_t = \beta_0 + \sum_{i=1}^m \beta_1 \Delta LASI_{t-i} + \sum_{i=1}^m \beta_2 \Delta LEXR_{t-i} + \sum_{i=1}^m \beta_3 \Delta LGDP_{t-i} + \sum_{i=1}^m \beta_4 \Delta LM2_{t-i} + \alpha_1 LASI_{t-1} + \alpha_2 LEXR_{t-1} + \alpha_3 LGDP_{t-1} + \alpha_4 LM2_{t-1} + \mu_t \quad (1)$$

Note that β_0 to β_4 and α_1 to α_4 are the parameters of the explanatory variables. Similarly, the Error Correction Model of the ARDL approach is specified as:

$$\Delta LASI_t = \beta_0 + \sum_{i=1}^m \beta_1 \Delta LASI_{t-i} + \sum_{i=1}^m \beta_2 \Delta LEXR_{t-i} + \sum_{i=1}^m \beta_3 \Delta LGDP_{t-i} + \sum_{i=1}^m \beta_4 \Delta LM2_{t-i} + \beta_5 ECM_{t-1} + \mu_t \quad (2)$$

The ARDL model has two parts; the first part of the model with β_0 to β_4 represents the short-run dynamics, while the coefficients α_1 to α_4 represents the long-run part of the model. The null hypothesis is defined as $H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$ which tell us that there is no long run relationship. The study began the analysis by conducting co-integration test of the bounds test in order to find out the evidence of long-run relationship. The calculated F-statistics is compared with the Critical Value as tabulated by Pesaran et al. [21]. If F-statistics is greater than the upper critical value, then the decision rule will be to reject the null hypothesis of no long-run relationship, whereas if it falls below a lower critical value, then the null hypothesis cannot be rejected and if it falls within these two critical bounds, then the result is inconclusive.

Discussion of Findings

When dealing with time series data, it is important to test the series' behavior so as to know the stationary levels. This has been carried out through the use of most frequently used testing techniques of Augmented Dickey Fuller and Phillips-Perron. The ADF results revealed that all the variables were stationary after first difference. Similarly, the P-P test shows that all the variables were stationary after first difference except money supply which is not stationary either at level value or after first difference (Table 1).

From the unit root test conducted, we found that the variables were integrated of the same order, that is $I(1)$. And that ARDL can be applied in modeling the series' relations irrespective of order of integrations. We therefore, move ahead to conduct ARDL bounds test for co-integration. The results of the test confirmed that there is an evidence of long run relationships. This is due to the fact that, F-Statistics value (4.29) is greater than the lower and upper critical bounds for all the significant levels. This ratifies the rejection of null hypothesis of no co-integration. The result is presented in Table 2.

Since the bounds test indicated the existence of co-integration among the series, we then move on to generate the long run coefficients of the ARDL and the result is presented in Table 3. The results confirm that, there is a positive and statistically significant relationship between exchange rate and stock market performance in Nigeria over the sample period. 10% increase (decrease) in exchange rate might lead to 7.71% increase (decrease) in stock market performance. This finding is associated with the findings of Yaya and Shittu [18]. Similarly, it has been found that there is positive and statistically significant influence between economic growth and stock market performance in Nigeria. An increase in economic growth may lead to increase in stock market

Variables	Augmented Dickey- Fuller		Phillips-Perron	
	Level	First diff.	Level	First diff.
LASI	3-0.5603	-4.7816***	-0.4536	-4.3072***
LREXR	-2.5609	-5.3732**	-2.5614	-5.8311***
LGDP2	-1.5902	-6.0194***	-1.3428	-7.6456***
LM2	-1.122	-3.5182*	-0.2856	-2.9423

***, **, *Indicate significant at 1%, 5% and 10% respectively.

Table 1: Unit root test (Augmented Dickey-Fuller and Phillips-Perron).

Test statistics		
F-statistics		4.29
Critical value bounds		
Significance levels	I(0) Bounds	I(1) Bounds
10%	2.37	3.2
5%	2.79	3.67
1%	3.65	4.66

Table 2: ARDL bounds test.

performance. A 10% rise in economic growth is associated with 18.23% rises in stock market performance. This also agreed with theoretical preposition that economic growth is associated the with increase in the performance of all the sectors in the economy which the stock market is one them.

Money supply reported to have negative and statistically significant influence on stock market growth. A 10% increase in money supply will lead to 16.11% decrease in stock market growth throughout the study period. The result maintained the theoretical assertion that increase in the volume of money in circulation may lead to increase in the price of goods and services in the economy. This further pushes consumer to spend more of his income to consumptions rather than investments and that metamorphosed into reduction in stock market performance (Table 3).

The estimated short run coefficients of the ARDL show that Error Correction Model (ECM) has the correct sign that is less than one, negative (-0.3273) and statistically significant at 1% (0.0000). This proved the evidence of co-integration among the variables. It implies that in the event of any disequilibrium in the economy, the system may correct itself from short run to long run equilibrium at the speed of about 33% every year. In addition, exchange rate has negative and statistically significant impact on stock market performance, while economic growth and money supply have positive and statistically significant effect on stock market performance in the short-run. The result is shown in Table 4.

To check that the model is reliable, diagnostic tests (serial correlation, heteroscedasticity and normality) were conducted. The results indicated that the model passes all the three tests. This is due to the fact that the null hypotheses of both tests cannot be rejected as a result of insignificant p-values (Table 5).

In addition to diagnostic tests, this study carried out the stability tests with the view to find the stability or otherwise of the model and parameters under estimation. The most frequently use techniques of cumulative sum of recursive residual (CUSUM) and cumulative sum of squares of recursive residual (CUSUMQ) were used and the results are presented in Figures 1 and 2. The CUSUM test show that the recursive

Dependent variable: LASI				
Variables	coefficients	Std. error	t-statistics	Prob.
LEXR	0.7711	0.2844	2.7114	0.0131
LGDP2	1.8229	0.6461	2.8232	0.0102
LM2	-1.6112	0.6582	-2.4491	0.0232
C	-0.5399	4.9999	-0.1079	0.915
R ² =0.99; Adj. R ² =0.98; DW=1.93; F-Stat 0.=333.92 (0.0000).				

Table 3: Result of the estimated long-run coefficients of the ARDL.

Dependent variable: ΔLASI				
Variables	Coefficients	Std. error	t-statistics	P-value
Δ(LREXR)	-0.2039	0.1076	-1.8951	0.0719
Δ(LGDP2)	0.7061	0.1548	4.5624	0.0002
Δ(LM2)	0.6247	0.1903	3.2829	0.0035
ECM(-1)	-0.3273	0.056	-5.8419	0

Table 4: Estimated short-run coefficients of the ARDL model.

Test	Test statistics	Prob. value
Serial correlation	0.0262	0.8731
Heteroscedasticity	0.4439	0.8632
Normality	1.9144	0.3839

Table 5: Results of the diagnostic tests.

error line slightly cut the critical line indicating the instability of model. This is associated with stock market collapse and persistence degree of volatility in local currency between 2011-2012. On the other hand, the CUSUMQ test, prove that the estimated model and parameters were stable because the recursive error falls between the two critical lines.

As indicated in Table 6, the Granger Causality test shows that, there is unidirectional causality running from exchange rate to stock market. This as a result of significant p-value of F-statistic (0.0074). This confirms the theoretical postulation that it is the fluctuations in exchange rates that lead to stock prices variations and is in consistent with the Kose et al. [6]. The results show no evidence of causality running from economic growth to stock market this is because F-statistics are not significant even at 10% level. Therefore, the null hypothesis cannot be rejected going by their p-values. Furthermore, there is a unidirectional causality runs from stock market to money supply.

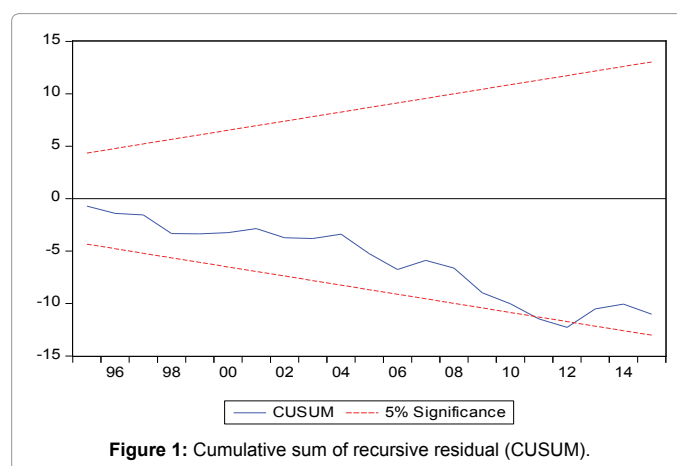


Figure 1: Cumulative sum of recursive residual (CUSUM).

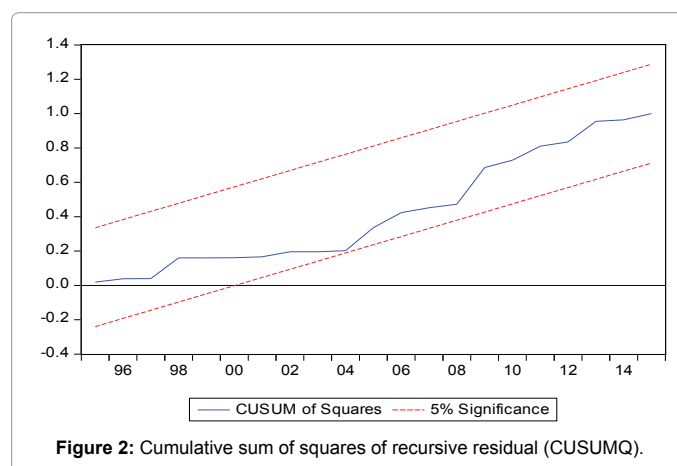


Figure 2: Cumulative sum of squares of recursive residual (CUSUMQ).

Null hypotheses	Obs.	F-statistics	P-values
LEXR does not Granger Cause LASI	30	0.8401	0.0074
LASI does not Granger Cause LEXR	30	2.0952	0.1593
LGDP2 does not Granger Cause LASI	30	0.1441	0.5454
LASI does not Granger Cause LGDP2	30	0.0464	0.7072
LM2 does not Granger Cause LASI	30	0.0387	0.8455
LASI does not Granger Cause LM2	30	5.0146	0.0336

Table 6: Result of the granger causality test.

Conclusion and Recommendations

Nigeria has over the years experienced numerous challenges such as exchange rate fluctuations, collapse in the stock market price among others. Stability in exchange rate and favorable growth in the stock market are the key determinants of economic growth of every economy. It is on this basis that this study investigates the relationship between exchange rate and stock market interaction in Nigeria using annual data from 1985 to 2015. The econometric techniques applied in the analysis were Augmented Dickey Fuller, Phillips-Perron, Autoregressive Distributed Lag Model (ARDL) and Granger-causality. The unit root test shows that all the series were stationary after first difference (I(1)). Furthermore, the Bound test for ARDL shows existence of long run relations among the series. In the long run also the ARDL results indicate that exchange rate has positive and statistically significant influence on the stock market fluctuations in Nigeria. On the same vain, it was revealed that economic growth has positive impact on variation of stock market. While money supply reported to have negative and statistically significant effect on stock market throughout the sample period in Nigeria. On the direction of causality, it was noted that exchange rate granger cause stock market without feedback effect. And that, there is no evidence of causality running from economic growth to stock market and vice versa. This study also revealed that stock market granger cause money supply without corresponding effect. From the foregoing, this study recommends the following: first there is need for policymakers to ensure effective implementation of existing monetary policy instruments and device strong way of harmonizing monetary and fiscal policies in order to maintain stable exchange rate and avoid structural break that affect the whole system including the stock market. Second, there is the need for government to intensify its efforts in diversifying the economy that will help to have more active economic sectors that can contribute positively in reducing the existing unemployment, poverty, crises and even boost the investment in the stock market. Finally, there is need for Central Bank of Nigeria to reduce the volume of money in circulation, which will help to reduce the price of goods and services in the economy vis-à-vis boosting the savings and increase the levels of investment in the long run.

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