Effect of Exchange Rate on Stock Price Movement in Nigeria

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Abstract. *Theories of exchange rate in developing economies suggest that between exchange rate and stock price movement, a positive relationship exists. In Nigeria, depreciation of local currency to many seems not to have brought about the expected increase in export or output in the industrial sector, let alone the firms' stock prices. This study was therefore set out to investigate the effect that exchange rate has on stock price movement in Nigeria and the direction of causality between the two. Data on exchange rate, interest rate, inflation rate, gross domestic product and stock market index in Nigeria were used for the analyses. Auto Regressive Distributed Lag (ARDL) test was used to assess the possibility of existence of a long run association between exchange rate and stock price movement. Results established a long run and significant relationship between exchange rate and stock price movement in Nigeria (F:12.89 $>I_o$ & I_1Bound, P-value < 0.05 for LEXR, LGDP LINF). However, the negative coefficients of the regressors; especially exchange rate, run contrary to existing theories on the benefits of depreciating exchange rates. This means that Nigeria has not fully reaped the expected benefits from devaluation of her local currency over the years. A unidirectional causality between exchange rate and stock price movement was also discovered. Causation flows from exchange to stock price (P-value < 0.05 for LEXR). This further suggests that most firms in Nigeria lack the absorption capacity to transform the accruing gains of currency depreciation to increased productivity and exports.*

Introduction

The two financial markets that are mostly traded all over the world are foreign exchange and stock markets. The general belief is that one tends to affect the other. This means that investors always look for the

correlation between the two markets for the purpose of predicting the future prices of stocks. As one of the largest economies in Africa, Nigeria has a good number of foreign investors who are major players in her stock market. This has been made possible by globalization powered by information and communication technology. To this end, a study on the effect of influence of exchange rates on stock price movement in Nigeria is therefore of great importance to many investors in African continent and the rest of the world.
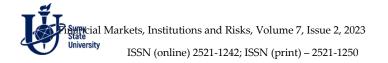
While there are existing literature on the effect of exchange rate on stock price movement globally, results and findings have been divergent and mixed as to whether there exists an empirically established relationship between the two variables. The direction of causality is also of great concern in determining which of the variables leads the other.

1. Literature Review

According to Parsva and Tang (2017), the traditional school of thought, also known as the flow-oriented model postulates that exchange rates Granger-cause stock price changes (Richards, Simpson & Evans, 2009). According to the school of thought, depreciating exchange rates bring about competitiveness of a firm in the international markets. This brings a rise in a firm's profits as well as its stock price; and vice-versa (Richards, Simpson & Evans, 2009; Akdogu & Birkan, 2016; Rao & Tolcha, 2016; Bala and Hassan, 2018). On the other hand, Parsva & Tang (2017) reveal that the portfolio balance school of thought, which is known as the stock-oriented model postulates that stock prices Granger-cause exchange rates to change rather than the other way round (Muzindutsi, 2011,). The second school of thought claims that a stock price movement (increase) will cause a huge capital inflow and this will in turn cause exchange rates to appreciate as a result of a rise in the demand for local currency (Frenkel, 1983; Aydemir & Demirhan 2009; Kutty, 2010; Nwaolisa & Kalse, 2012; Umer, Sevil & Kamisli, 2015; Huy, 2016; Akdogu & Birkan, 2016; Parsva & Tang, 2017; Amba & Nguyen, 2019). The proponents maintained that causality flows from stock prices to exchange rates. Although studies by Javangwe & Takawira (2022), Luqman and Koser (2018), Tamunowariye & Anaele (2022) and Sanusi & Kapingura (2022) empirically established that there is a relationship between exchange rate and stock price movement, but the direction of causality between the two was not clearly emphasized. In another dimension, Adedokun & Olaniyi (2021) showed that cointegration exists between the variables and the Granger causality test results revealed the existence of bi-directional causal linkage between the Johannesburg Stock Exchange All share index and Rand/US exchange rates in the short run. No doubt, there are mixed results and controversies surrounding the direction of causality between exchange rate and stock price movement in literature. Hence, no consensus has been reached as regarding the factors that fully clarify the movement in stock prices despite a lot of empirical studies into the subject matter.

Studies in Nigeria on the topic have resulted into inconclusive findings. Studies by Zubair (2013), Okoro (2017) and Oluwatosin and Terver (2020) documented an absence of long run association between stock price and exchange rates. Conversely, the studies of Sulaiman and Abba (2017) and Bala Hassan (2018) revealed that exchange rate has a significant positive effect on stock price movement. Emirical findings of Okwuchukwu (2015) took a different position by reporting a long run negative relationship. While Sulaiman and Abba (2017), Bala and Hassan (2018) and Adedokun and Olaniyi (2021) established a bidirectional causal link within stock price movement and exchange rate, Okwuchukwu (2015) provided empirical proof of a unidirectional connection. In their own studies, Zubair (2013) and Okoro (2017) discovered absence of causal link within exchange rate and stock price.

Osisanwo and Atanda (2012) in their study use the OLS method in analysing the determinants of stock market returns in Nigeria. The data analysed covered the period of 1984 to 2010. In this study, exchange rate was one of the determining factors of stock returns. The study of Yaya and Shittu (2010) reveal that exchange rate and inflation have a significant link with conditional stock market volatility in Nigeria. The study used the Sentana's QGARCH model to analyse data covering the period of 1991-2008. Umoru and Asekome (2013) adopt the co-integration and the Granger-Sim causality method to investigate the relationship between Naira-US$ exchange rate and stock price movement in Nigeria covering the period of year 2000-2012. The study discovers a positive co-integrating link between stock market prices and the Naira-US$ exchange rate movement in Nigeria. Furthermore, there was the evidence of a bi-directional Granger causality between stock prices and exchange rate in Nigeria.

Zubair (2013) examine the long run and causation between stock price and exchange rate for a period between 2001 and 2011 in Nigeria. The results of the cointegration test failed to indicate existence long run relationship before and during the global financial crisis within the period. While the granger causality tests revealed an absence of causal relationship between the stock price and exchange rates, a unidirectional causality flowing from broad money supply to stock price before the period of the crisis was established. Subair and Salihu (2013) investigate the influence of exchange rate volatility on the Nigerian stock market using error-correction model (ECM). Exchange rate volatility was generated through the GARCH process which showed to have a negative impact on the Nigeria stock market. The study covered the period 1981-2007.
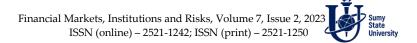
Okwuchukwu (2015) used the ordinary least square and error correction mechanism for a sample frame between from 1980 and 2013 to investigate the nexus between exchange rate volatility, stock market and foreign direct investment in Nigeria. The empirical investigation revealed that both in the long run and short run, exchange rate volatility has a significant and negative effect on the inflow of foreign direct investment in Nigeria. Apere and Karimo (2015) find exchange rate volatility to have a positive impact on stock returns while it has a negative impact on share price fluctuations in Nigeria. This was in a study which appraised the impact of exchange rate volatility has on share price fluctuations in Nigeria. The study made use of the GARCH (1,1) model and did a granger causality test on a monthly data from the period of 1985 to 2012. The results further indicated the presence of a unidirectional causality from share price to exchange rate. Evbayiro-Osagie and Emeni (2015) examine the effect changes in inflation rates, financial openness and exchange rates have on stock returns volatility in Nigeria. With the use of ARCH and GARCH models to analyse data spanning from 1985-2012, the study found no significant impact between the variables.

With GARCH (1,1) models, Nkoro and Uko (2016) attempt an investigation into the relationship between stock price, inflation, and exchange rates volatility volatility in Nigeria. The empirical findings established a negative relationship between the three variables. Examining the impact macroeconomic factors have on stock market performance from 1986 to 2015 in Nigeria, Okoro (2017) employ Ordinary Least Square. The outcome was that the selected macroeconomic factors, including exchange rate were not significant to explain stock price behaviour. He concluded that macroeconomic factors cannot explain stock prices movement. Abimbola and Olusegun (2017) appraise the correlation of exchange rate volatility, stock market performance and aggregate output in Nigeria. The findings show that exchange rate and stock price are volatile after employing the ARCH and GARCH model on a quarterly data covering the year 1986-2015. The study concludes the presence of a strong causal affiliation between exchange rate volatility, stock market price and economic growth in Nigeria.

Sulieman and Abba (2017) estimate the connection of exchange rate volatility to stock market prices in Nigeria covering the period of 1985 to 2014, using the GARCH technique, Johansen Co-integration, and Error Correction Mechanism. The empirical result shows that exchange rate and inflation rate contribute significantly to the sources of volatility in stock prices in the short and long run. In addition, the study reveals a long run equilibrating connection existing amongst the variables. Daggash and Abraham (2017) analyze the exchange rate returns effect on equity prices in Nigeria and South Africa and checked for the presence of volatility in the Naira and the Rand using the Vector Autoregressive (VAR) model. The study finds the existence of volatility in the returns of the Rand, while such does not exist in the Naira return. Fapetu, Adeyeye, Seyingbo and Owoeye (2017) use monthly data to examine the relationship between exchange rate volatility and stock market performance in Nigeria. A positive relationship between exchange rate and market capitalization was found.

Bala and Hassan (2018) use data spanning from 1985-2015 to study the connection between exchange rates and stock market in Nigeria. There is a proof of causality flowing from stock prices to money supply. No evidence of causality between economic growth and stock prices was discovered. Udoka, Nya and Bassey (2018) review the effect of macroeconomic determinants of stock movements in Nigeria using the autoregressive distributive lag (ARDL) for the period 1986 to 2014. The empirical findings from the study indicate that macroeconomic variables such as gross domestic product, exchange rate, interest rate and inflation rate have no long run relationship with stock prices. The study thus, concludes that no long run association exists between macroeconomic variables (gross domestic product, exchange rate, interest rate, inflation rate) and stock price movements in Nigeria.

Izunobi, Nzotta, Ugwuanyim and Benedict (2019) evaluate the relationship exchange rate, interest rate and inflation has on stock market volatility. Using a monthly series data which covered from 1994-2014, the study employed the GARCH (1.1) estimation technique. The study found exchange rate and having positive relationships with stock market returns while interest rate had a negative relationship with stock market returns in Nigeria. Mannaseh, Chukwu, Abada, Ogbuabor, Lawal and Alio (2019) examine the association between stock prices and exchange rate using the multivariate VAR-GARCH model on monthly data between 2000 and 2014. The study found a stable long-term relationship between exchange rate and stock prices. Furthermore, findings revealed a significant mean spill over unidirectionally flowing from stock market to exchange rates. From the variance equation results, the presence of a bidirectional volatility transmission effect is seen between stock price and exchange rate. This proves that past innovations in stock market have a significant impact on future volatility in the foreign exchange market, and vice versa.

One plausible reason for the conflicting results may be due to the instability of the causal relationship between stock price movement and exchange rates which can only be overcome by using a longer analysis period; and this is thirty-four years (1986 to 2019) for this study. To specifically provide insights for capital market operators and investors, the purpose of this study is to evaluate the effect of exchange rate on stock price movement with a view to determining the direction of causality (if exists) between the two in Nigeria. Achievement of the objectives led to the formulation of the following hypotheses.

$H0_1$: Exchange rate has no significant effect on stock price movement in Nigeria.

$H0_2$: Exchange rate and stock price movement have no significant causation or direction of causality in Nigeria.

2. Methodology

The study sourced annual data from the publications of the Nigerian Stock Exchange and the Statistical bulletin of the Central Bank of Nigeria for the period between 1986 and 2019. The research model of Bala and Hassan (2018) which was adopted for the study expresses stock market index as a function of exchange rate, gross domestic product and money supply. The model is given as:

$$SMI = f(EXR, GDP, M2, \mu) \tag{1}$$

Estimated as:

$$SMI = \beta_0 + \beta_1 EXR + \beta_2 GDP + \beta_3 M2 + \mu \tag{2}$$

For this study, equation 1 was expanded to include inflation rate and interest rate with the exclusion of money supply. Inflation rate was considered a direct mirror of money supply.

The model is given as:

$$SMI = f(EXR, GDP, INFR, INT, \mu) \tag{3}$$

Estimated as:

$$SMI = \beta_0 + \beta_1 EXR + \beta_2 GDP + \beta_3 INF + \beta_4 INT + \mu \tag{4}$$

Where:

SMI = Stock market index; EXR = Nominal Exchange rate; GDP = Gross domestic product; INFR = Inflation rate; INT = Interest rate; μ = Error term; β_0= Intercept or constant term; $\beta_1 - \beta_4$= Coefficients of regressors.

The study employed the Autoregressive Distributed Lag (ARDL) bound test technique of Pesaran, Smith and Shin (2001) as an inferential statistics for its analyses. This technique was considered most appropriate to handle structural break problems and to cope with data having different orders of integration and are capable of leading to spurious results if not well handled.

This is expressed as:

$$\Delta LSMI_t$$
$$= \beta_0 + \sum_{i=0}^{n} \beta_1 \Delta LSMI_{t-1} + \sum_{i=0}^{n} \beta_2 \Delta LEXR_{t-1} + \sum_{i=0}^{n} \beta_3 \Delta LGDP_{t-1} + \sum_{i=0}^{n} \beta_4 \Delta LINF_{t-1} + \sum_{i=0}^{n} \beta_5 \Delta LINT_{t-1}$$
$$+ \alpha_1 LSMI_{t-1} + \alpha_2 LEXR_{t-1} + \alpha_3 LGDP_{t-1} + \alpha_4 LINF_{t-1} + \alpha_5 LINT_{t-1}$$
$$+ \mu_t \dots\dots\dots\dots\dots\dots\dots\dots \qquad \dots (5)$$

Note that β_0, β_5 and α_1 to α_5 are the parameters while Δ denotes the first difference operator. Similarly, ARDL model which is unrestricted ECM for stock-oriented and flow-oriented models (stock price movement and exchange rates with other independent variables) was expressed as follows:

$$\Delta LSMI_t = \beta_0 + \sum_{i=0}^{n} \beta_1 \Delta LSMI_{t-1} + \sum_{i=0}^{n} \beta_2 \Delta LEXR_{t-1} + \sum_{i=0}^{n} \beta_3 \Delta LGDP_{t-1} + \sum_{i=0}^{n} \beta_4 \Delta LINF_{t-1}$$
$$+ \sum_{i=0}^{n} \beta_5 \Delta LINT_{t-1} + \beta_6 ECM_{t-1} + \mu_t \dots\dots\dots\dots \qquad \dots (6)$$

The models for Granger causality test to examine the direction of casuality between stock price movement and each of the independent variables were given as:

$$LSMI_t = \sum_{i=1}^{n} \beta_i LEXR_{t-1} + \sum_{j=1}^{n} \alpha_j LSMI_{t-j} + u_t \dots\dots \qquad \dots (7)$$

$$LEXR_t = \sum_{i=1}^{n} \beta_i LEXR_{t-1} + \sum_{j=1}^{n} \alpha_j LSMI_{t-j} + u_t \dots\dots \qquad \dots\dots (8)$$

3. Results

Unit Root Test

For estimation purpose, it is important to know whether the variables are integrated of different orders. To achieve this, the unit root test must be performed. The ADF test was considered appropriate because of its popularity and wide application (Ukoro & Uko; 2016). The test shows that exchange rate (LEXR), gross domestic product (LGDP), inflation (LINF) and interest rate (LINT) were stationary at level, that is, they are integrated of order zero [I(0)], while stock market index (LSMI) is stationary at first difference, that is, it is integrated of order one [I(1)]. The means that there existed a mixture of differencing orders of integration which theoretically nullifies the application of Johansen co-integration and justifies why we used ARDL as the estimation technique.

The ARDL co-integration test shows that the F-statistics of 12.89 is higher than any of the Upper Bound table values at 10%, 5% 2.5% and 1% level of significance respectively. A long run relationship is established when the F-statistic exceeds the critical value band. This implies that the null hypothesis which states that Exchange rate has no significant effect on stock price movement in Nigeria cannot be accepted. Hence, a significant long-run interaction is present between the two variables in the model.

Specifically, results of the long run co-integrating coefficient show that a negative relationship exists between exchange rate and stock market index in Nigeria. The relationship is statistically significant at 5% level of significance. Economically, it implies this is that stock prices and exchange rates move in opposite directions in the Nigerian economy. Since a fall in the value of naira to dollar means more naira will exchange one dollar, a negative relationship between stock price index and exchange rate therefore implies that as more naira is exchanging one dollar (a fall in the value of Nigeria currency), the stock price index is falling. The depreciation in exchange rates fails to increase the competitiveness of a firm in the international markets. It has also failed to increase the firm's profits and its stock price and vice-versa in contrast to the view of Dornbusch and Fischer (1980).

Results of the short-run dynamic and the error correction model reveal that the error correction term coefficient ECM (-1) is correctly signed and is significant at 5% level. It implies that a high rate of adjustment of the short-run inconsistencies was being integrated into the long-run equilibrium relationship. The short run results also discovered that exchange rate has a significant positive association with stock market index.
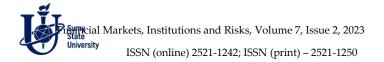
Lastly, from the results of the causality test, it could be deduced that exchange rate granger causes stock price movement in Nigeria. Therefore, the second hypothesis which states that no significant causation or direction of causality between exchange rate and stock price movement cannot be accepted. The test further indicates that there exists a uni-directional causality between EXR and SMI as evidenced by its probability value 0.0009. It connotes the existence of one-way causation flowing from exchange rate to stock prices (SMI) movement in the country. This confirms that the portfolio balance school of thought (the stock-oriented model) is applicable and relevant in Nigeria.

4. Discussion

From the analyses, it is evident that the study discovered the presence of a significant negative long run interaction between stock price movement and exchange rate in Nigeria using the Pesaran ARDL bound test. An F-statistic of 12.89 is higher than the lower and upper bound values of 2.86 and 4.01 respectively as contained in the appendix. The implication of this is that a positive change in exchange rate will cause a change in stock price movement and this will affect both local and foreign investors. A significant negative long run relationship amid exchange rate and stock price movement in Nigeria contradicts the position of the Traditional School of thought and corroborated the findings of Okwuchukwu (2015) in Nigeria as further depreciation of exchange rate may never bring the desired competitiveness of a firm in the international markets and the attendant increase in the firm's profits and stock prices. Gross domestic product has negative significant effect both in the short and long run respectively with stock prices. Inflation has a significant negative effect with stock prices on the long run while it depicted an insignificant negative effect with stock prices on the short run. Interest rate revealed a positive and insignificant effect on the long run with stock prices while on the short run; the reverse is the case, indicating negative and insignificant effect. There was evidence that the short run fluctuations of the explanatory variables could bring about restoration to equilibrium in stock market index within a year. This is because of the significance of the ECM coefficient with appropriate sign. It is worth noting that the Pairwise granger causality test indicated a uni-directional causality (though negative) flowing from exchange rate to stock price movement. This finding gives support to flow-oriented model and the empirical findings of Richards, Simpson & Evans, 2009; Akdogu & Birkan, 2016; Rao & Tolcha, 2016; Bala and Hassan, 2018. It postulates depreciating exchange rates bring about competitiveness of a firm in the international markets. However, the condition for reaping the benefits of depreciating exchange rates is that the local industries must remain healthy. The weak value of naira currency means that Nigerian firms lack the capacity to convert currency depreciation to increased productivity and exports.

Conclusion

In this study, we have shown that exchange rate has a significant negative effect on stock price movement, and that causation uni-directionally runs from exchange rate to stock prices in Nigeria. Based on the empirical findings from this study, it can be concluded that the traditional school of thought, also known as the flow-oriented model which postulates that exchange rates granger-cause stock price changes explains the causal link between exchange rate and stock price movement in Nigeria. However, we inferred that performance of the industrial sector of the Nigerian economy has not helped to improve the exchange rate position; hence, the negative effect of the former on the latter. For exchange rate to improve, industrial productivity must also improve. It is against this background that the study recommended that a business environment and sound fiscal discipline that will facilitate growth should be stimulated by policy makers to enhance the real or industrial sector and in the process boost the economy through increased industrial productivity and exports. Our analyses in this paper rest on the use of macroeconomic (aggregate) data throughout to examine the interaction between exchange rates and stock price movement. Since the paper is not an end to itself, future researchers that are interested in the topic can make use of microeconomic (individual firm's) data so that the findings can be firm or industrial sector specific to facilitate results' comparison.

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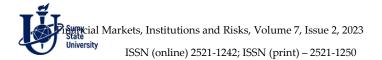
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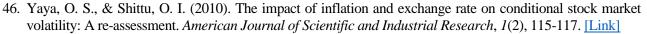
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Appendix

Unit Root Test

Table 1. ADF Unit Root Test Results at Level and First Difference

Variables	ADF Test Statistics	Critical Value	Order of Integration	Remarks
LSMI	-4.066892	-2.957110	I(1)**	Stationary
LEXR	-3.636301	-2.954021	I(0)**	Stationary
LGDP	-3.894385	-2.954021	I(0)**	Stationary
LINF	-3.085965	-2.954021	I(0)**	Stationary
LINT	-4.951714	-3.646342	I(0)***	Stationary

Note: *(*)(**)(***)   -   Significant at 10%(5%)(1%) percent level respectively*

Source: E-view 9 Statistical Package.

Table 2. Pesaran Shin (1999) Bounds Test Result

Test statistics	Value	Regressors (k)
F-statistics	12.891	4
Critical Value Bounds	I(0) Bound	I(1) Bound
10%	2.453	3.524
5%	2.865	4.013
2.5%	3.252	4.491
1%	3.741	5.060

Source: E-view 9 Statistical Package.

Results of the Long Run Co-Integrating Coefficients

Table 3. Dependent variable (SMI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.104048	1.011591	-0.102855	0.9191
LEXR	-0.473847	0.171088	-2.769600	0.0115
LGDP	-0.598158	0.111205	-5.378896	0.0000
LINF	-0.668905	0.154028	-4.342761	0.0003
LINT	0.687491	0.632766	1.086485	0.2896

Source: E-view 9 Statistical Package.

Table 4. Results of the Short-run Dynamic and the Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LSMI(-1))	0.078548	0.154651	0.507903	0.6177
D(LSMI(-2))	-0.292835	0.157533	-1.858876	0.0795
D(LEXR)	0.612733	0.250129	2.449666	0.0248
D(LGDP)	0.991327	0.725554	1.366303	0.1887
D(LGDP(-1))	0.781581	0.805783	0.969964	0.3449
D(LGDP(-2))	1.887444	0.713051	2.646998	0.0164
D(LINF)	-0.186260	0.102782	-1.812186	0.0867
D(LINT)	0.563573	0.416475	1.353198	0.1927
ECM (-1)	-0.570762	0.159994	-3.567408	0.0022

Source: E-view 9 Statistical Package

Table 5. Pairwise Granger Causality Tests

Lags: 2				
Null Hypothesis:	**Obs**	**F-Statistic**	**Prob.**	**Decision**
LEXR does not Granger Cause LSMI	34	7.20304	0.0009	Reject
LSMI does not Granger Cause LEXR		0.11695	0.8901	Accept

Table 5 (cont.). Pairwise Granger Causality Tests

LGDP does not Granger Cause LSMI	34	2.34580	0.1150	Accept
LSMI does not Granger Cause LGDP		0.25016	0.7805	Accept
LINF does not Granger Cause LSMI	34	0.58647	0.5632	Accept
LSMI does not Granger Cause LINF		3.40150	0.0481	Reject
LINT does not Granger Cause LSMI	34	1.77488	0.1887	Accept
LSMI does not Granger Cause LINT	6.32338	0.0056		Reject

Source: E-view 9 Statistical Package.