Exchange Rate Volatility, Stock Market Performance and Output in Nigeria

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Abstract*: This study investigates the effect of exchange rate volatility and stock market performance on output by adopting quarterly data for Nigeria from the period 1981 - 2019. The Eview9 Statistical Software was employed to analyze the data empirically. The Unit root test was adopted to test the stationarity of variables. The data were analyzed using a three-step procedure and generalized autoregressive conditional heteroskedasticity (GARCH). The models were tested with different econometrics and statistical instruments. The results from the findings indicate that exchange rate volatility was statistically significant with productivity, however, it was revealed that exchange rate volatility is high and that shocks in exchange rate reduce the level of productivity in Nigeria as well reduce the level of stock market performance in Nigeria. The findings also revealed that market capitalization (MCR) and all share index (ASI) were rightly signed, implying that an increase in market capitalization (MCR) and all share index (ASI) improve output level in Nigeria. Also, the results showed stock market performance was statistically significant with output, even as interest rate failed to improved output in Nigeria. We recommend amongst others that, the government should adopt appropriate macroeconomic policies to cushion the effect of exchange rate volatility so as to create an investment-friendly environment that has the capacity to boost investment, will help to guarantee employment generation, maintain a high level of productivity and boost the performances of all the sectors of the economy for rapid economic development in Nigeria.*

Keywords: *Exchange Rate, Volatility, Stock Market Performance, Output, Nigeria.*

I. Introduction

The bedrock of any economic prosperity is the productive sectors given their potentials of accelerating domestic consumption and foreign exchange earnings (Kawode, 2015) and Oteh (2010), opined that sustained development and growth of the productive sector strengthen the entire economy by way of increased productivity, employment, urbanization and favourable cost of living. The development of a vibrant productive sector which operates at full capacity does not only have the potential to generate massive employment, reduce poverty, create wealth, enhance exports and diversify foreign exchange earnings but also serve as an indicator of the global competitiveness of the economy concerned. The extent to which the productive sectors of the economy thrive depends on the stability of the exchange rate and the performance of the stock market.

The exchange rate is the rate at which one currency is exchanged for another. It reflects the ratio at which one currency can be exchanged with another currency. It is the value of a foreign nation's currency in terms of the home nation's currency. It also specifies how much one currency is worth in terms of the other. The exchange rate plays an important role in economic development and attainment of macroeconomic objectives such as economic growth, price stability, a favourable balance of payment conditions and equitable distribution of income if properly managed. Economic growth is measured in terms of persistent growth in national income which translates to an increase in the number of goods and services produced in an economy. Growth is said to occur when a country's productive capacity is on the increase (Akpan, 2008). Production of goods and services involve exports and imports which in turn involves transactions in foreign exchange. Maintaining relative exchange rate stability is crucial to both internal and external balance and economic growth. It is an important economic variable as its appreciation or depreciation affects the performance of all the sectors in an economy and most especially the manufacturing sector (Odili, 2014). The choice of exchange rate regime can affect economic growth through its effects on macroeconomic variables which are important determinants of growth. Factors such as productivity, export, international trade, capital flows, and economic growth are highly affected by the variation of the exchange rate. According to the balance of payment theory, the exchange rate of the currency of a country depends on its balance of payment position. This is because the demand and supply of foreign exchange are from the debit and credit items in the balance of payments respectively representing what

comes into the country (imports) and what goes out(export) of a country. If the demand for foreign exchange is higher than its supply, the price of foreign currency will go up and if the demand for foreign exchange is lesser than its supply, the price of foreign exchange will decline. The stock market activity affects the economy through the creation of liquidity.

There is a widespread contention that volatility of the exchange rates of developing countries is one of the main sources of economic instability around the world. The impact of the global economy on developing countries like Nigeria is driven significantly by swings in the currencies of the major economic powers like United State. In recent years these swings have been enormous, volatile and frequently unrelated to underlying economic fundamentals (Philippe, et al., 2006).

The liberalization of capital flows in developing countries over the last three decades and the enormous increase in the scale and variety of cross - border financial transactions have clearly increased the magnitude of exchange rate movements in most countries with underdeveloped capital markets and where there is not yet a track record of consistently stable economic policies. Currency crises in emerging markets, which have become more frequent in the last two decades, are especially notable cases of large exchange rate volatility (Carrera & Vuletin, 2003). This has been of particular concern to developing countries and emerging market economies. In addition, the transition to a market-based system often involves major adjustments in the international value of these economies' currencies. Other changes in the world economy may have reduced the impact of exchange rate volatility.

It should be noted that previous studies dealing with the effects of exchange rate volatility on economic growth have often yielded mixed results. This is explained by the effects of exchange rate volatility on the dynamics of growth are contradictory. On the one hand, exchange rate volatility may be considered as a shock absorber and seems to be more appropriate for countries experiencing frequent real shocks. Also, the relationship between exchange rates and economic growth also depends on other control variables such as financial development (Aghion, et al. 2009, Ndambendia, 2011), and exchange rate regime. Also, empirical evidence linking stock market development indicators to output has been inconclusive even though the balance of evidence is in favour of a positive relationship between stock market development indicators and output. It is also evident in literature that most studies also used annual data and ordinary least square (OLS) technique Nsofo, et al. (2017), Subair and Salihu (2013), and Ezeoha, et al. (2009). This is the gap the present study intends to fill as it examines the effect of exchange rate volatility and stock market performance on productivity by adopting quarterly data for Nigeria and employing a three-step procedure, and generalized autoregressive conditional heteroskedasticity (GARCH) modelling.

The aim of this study is to empirically investigate the relationship between exchange rate volatility, stock market performance and output in Nigeria. However, the specific objectives is to: i. determine the impact of exchange rate volatility on output in Nigeria; ii. ascertain the effect of exchange rate volatility on stock market performance in Nigeria; and iii. examine the impact of stock market performance on output in Nigeria.

Hypotheses

The hypotheses to be tested in this study are stated in directional form as follows:

(I)   Volatility in the exchange rate will adversely impact output in Nigeria.
(II)   Exchange rate volatility will lead to a reduction in stock market performance in Nigeria.
(III)   An improvement in stock market performance will lead to an increase in the level of output in Nigeria.

II.   Literature Review

Conceptual Clarifications

Exchange Rate Volatility

Exchange rate volatility is defined as the risk associated with unexpected movements in the exchange rate (Ilhan, 2006). The volatility is the measurement of the amount the frequency of these exchange rates as well as the rates change. With the use of futures to lock in exchange rate, it can reduce the effects of price change even though this volatility is quite difficult to avoid in such circumstances. Volatility can occur in any security that

rises or falls in value. The term is most often used in conjunction with the stock market, but foreign currencies can be volatile as well. When exchange rates are floating exchange rates, as opposed to fixed exchange rates, they are likely to go up and down in value depending upon the strength of the economies involved. As a result, volatility is something that affects any business undertaking involving two different countries.

Exchange rate volatility also refers to the exchange rate of one currency note to the other. Exchange rates are never static. The supply and demand of significant currencies fluctuate over time. Thus, exchange rate volatility refers to the tendency for foreign currencies to appreciate or depreciate in value, thus affecting the profitability of foreign exchange trades. The exchange rate is defined as the price of one currency in terms of another currency. In a floating exchange rate regime, the transaction costs are higher than with a pegged or fixed exchange rate. Volatility is defined as an unobservable or latent variable, deterministic or stochastic. There have however been studies that try to make the exchange rate volatility an observable variable, with varied results (Bauwens & Sucarrat, 2005). Exchange rates are highly volatile in the short run and are very responsive to political events, monetary policy and changes in expectations. In the long run, exchange rates are determined by the relative prices of goods in different countries (Samuelson & Nordhaus, 2001).

Stock Market

The stock market is a platform where business enterprises (companies) and government raise long-term funds for various investment plans (Ifionu & Omojefe, 2013). In this wise, the stock market is an integral part of the financial system that provides an efficient delivery mechanism for mobilization and allocation, management and distribution of long-term funds for investment project (Alile & Anao, 1990). Its functions are evident through the interplay of individuals, institutions and various instruments.

Sule and Momoh (2009) see the stock market as a network of specialized financial institutions, series of mechanisms, processes and infrastructure that, in different ways, ensure the coming together of suppliers and users of medium to long term capital for investment in socio-economic developmental projects. The stock market is a segment of the financial system that accommodates certain institutions for the creation, custodianship, distribution and exchange of financial assets and management of long-term liabilities and gross fixed capital formation (Osaze, 2007). The stock market has two segments namely, the primary and secondary markets. The primary market creates the platform through which governments and corporate organizations raise fresh funds through the issuance of securities (Sa'adu, 2014). Otherwise, the primary market is known as the new issues market. These new issues include public offers, right issues and private placements. On the other hand, the secondary market provides the avenue for investors to buy or sell securities that were earlier issued in the primary market.

Stock Market Performance Indicator

Formal capital market activities are representatively measured by the performance of the stock market such as market capitalization, all shares index (ASI), volume and value of transactions (VAT), number of deals and new issue of securities (NIS) of the Nigerian stock exchange. Market capitalization is the total value of all shares of publicly-traded company. Market capitalization is calculated by multiplying the total number of shares by the market price per share. Market capitalization is one of the basic measures of the worth of publicly-traded company; it is a way of determining the actual value of a company. Also, the investment community uses this figure to determine a company's size or worth, as opposed to sales or total assets figures (Ekezie, 2002). Generally speaking, a higher market capitalization indicates a more valuable company. Consequently, it is the sum of the current market value of all securities traded on a financial market. New issues market is the market where companies can raise finances by issuing shares or by floatation of securities. In other words, it is when a company attempts to raise funds by issuing additional shares or an initial public offer (IPO) to the general public who would wish to invest in the shares of the company. An initial public offering (IPO) is a first-time offering of shares by a specific firm to the public (Agarwal, 2001). Volume of transaction refers to the total amount of securities traded in the capital market regardless of what type of security instrument. The volume of transactions often determines the level of transactional activities or the performance of the capital market as far as the business transaction of the market is concerned and this, in turn, could have an effect on the growth of an economy which could either be a positive or negative outcome of the transaction volume (Adewoyin, 2004).

Output

The term productivity is the measure of how resources are brought together in organizations or the economy and utilized for accomplishing a set of results. Productivity is reaching the highest level of output performance of an economy with the least expenditure of resources. Productivity is commonly used to refer to the volume of goods and services produced within some specific unit of time usually one year. Cecunc (2004), sees productivity as an

index expressed as the ratio of output over input. Productivity is increased output and a decrease in scrap and costs of production. It is a measure of national efficiency for output using available resources. It is a reflection of the relationship between the total output of goods and services and the total input. Productivity is the relationship between the output generated by production or service and the input provided to create this output.

Productivity in economics is equated with the real gross domestic product or simply economic growth. According to Jhingan (2007), productivity or output or economic growth is the quantitative sustained increase in a country's per capita output or income accompanied by an expansion in its labour force, consumption, capital and volume of trade. To Akpakpan (1987), productivity or economic growth is the achievement of a yearly increase in both the total and per capita output of goods and services. It refers to the sustained increase in the actual output of goods and services of the nation concerned.

Theoretical Framework

Though there are several theories on the connections between exchange rate fluctuations, stock market operations and the working of an economy, some of these theoretical views which are relevant to this study were presented in this section. The abridged versions of the theories were discussed.

The Purchasing Power Parity

The theory of purchasing power parity (PPP) illustrates the relation between prices and exchange rates. Even though the origins of the PPP concept is traceable to the Salamanca School back in 16th-century Spain, its modern use as a theory of exchange rate determination began with the work of Gustav Cassel (1918), who recommended PPP as a means of amending pre–World War I exchange rate parities for countries resolved to return to the gold standard system after the conflicts ended. Some modification was necessary because countries that left the gold standard in 1914 witnessed extensively different rates of inflation during and after the war. As a principle of exchange rate determination, the easiest and powerful form of PPP (i.e. absolute PPP) is based on an international multi-good edition of the law of one price. Absolute PPP envisages that the exchange rate should adjust to equate the prices of national baskets of goods and services between two countries because of market forces driven by arbitrage.

The Monetary Model of Exchange Rates

This theory postulates that exchange rates are determined in the process of equilibrating or balancing the stock or total demand and supply of money in each nation. According to the monetary approach, the nominal demand for money is stable in the long run and positively related to the level of nominal national income but inversely related to the interest rate. The nation's money supply is equal to its monetary base times the multiplier. The nation's monetary base is equal to the domestic credit created by its monetary authorities plus its international reserve. Unless satisfied domestically, an excess supply of money in the nation results in an outflow of reserves, or a balance of payment deficit under fixed exchange rates and a depreciation of the nation's currency(without any international flow of reserves) under flexible exchange rate. The opposite takes place with an excess demand for money in the nation.

Flow Oriented Model

This model is developed on the premise that a causal association flows from the exchange rate to the prices of stock in the stock market. In other words, exchange rate movements affect stock prices. Exchange rate changes affect the competitiveness of firms through their impact on input and output prices (Joseph, 2002). When the exchange rate appreciates, exporters will be negatively affected. This is because currency appreciation gives rise to the higher or more increased price of exports in the international market. Furthermore, demand for exports will decline, as they will be seen as expensive by buyers on the international market; resulting in a competitive loss for exporting nations internationally. Consequently, returns on export are expected to shrink, and when these occur, exporting firms will also lose their competitiveness in the domestic stock market. Their attractiveness on the domestic stock market is also expected to decline, leading to decreasing value in their stock prices. The empirical outcome is an inverse association between the domestic currency and stock prices.

Empirical Review

Asher (2012) examined the impact of exchange rate fluctuations on Nigeria economic growth for the period of 1980 – 2010 by using time series data. The result showed that the real exchange rate has a positive effect on economic growth.

Also, Nazar and Bashiri (2012) investigated the relationship between real exchange rate uncertainty and private investment in Iran for the period of 1988 to 2008 by using quarterly data and applying bivariate generalized autoregressive conditional heteroskedasticity (Bivariate GARCH) model in the Iranian economy. The study revealed that real exchange rate uncertainty significantly influences private investment and has a negative effect on it; while private investment uncertainty affects the level of private investment negatively.

Okorontah and Odoemena, (2016) investigated the effects of exchange rate fluctuation on the economic growth of Nigeria. Using annual data for the period 1986-2012, the study employed the Ordinary Least Square (OLS) technique, the Johansson co-integration test and the Error Correction Mechanism (ECM) to examine the relationship between exchange rate and economic growth. The result suggests that there is no strong relationship between exchange rate and economic growth in Nigeria. It was, therefore, suggested that Nigeria improve its competitive capacity in the international market through export diversification.

The relationship between exchange rate volatility and stock market performance has been extensively studied in the literature. For example, Sekmen (2011) conducted a study to analyze the impact of exchange rate impulsiveness. The study made use of squared residuals from the autoregressive moving average (ARMA) models, derived from stock returns for the United States, spanning from 1980 to 2008. The study reported a negative impact of exchange rate fluctuation on the stock returns of the United States. This is due to the accessibility of hedging variables, which could not reduce the inverse impact of exchange rate fluctuations on trade volume.

Olugbenga (2012) investigated the long-run and short-run impact of exchange rate on stock market development in Nigeria over 1985:1–2009:4 by adopting the Johansen cointegration approach. The estimated output of the study revealed a significant positive impact of stock market performance on the exchange rate in the short run. On the other hand, the study reported a significant inverse effect of stock market performance on the exchange rate in the long run.

Subair and Salihu (2013) examined exchange rate volatility and the stock market evidenced from Nigerian through the Error Correction model, this study investigated the effects of exchange rate volatility on the Nigeria stock markets. The study found that the exchange rate volatility generated via the GARCH process exerts a stronger negative impact on the Nigerian stock market. However, the rate of inflation and interest rate showed no long run association with stock market capitalization. This could be due to the fact that Government participation in the market outweighs other participants. The study recommended that a coordinated monetary and fiscal policy should be put in place to checkmate the fluctuation of the exchange rate in order to deepen the depth of the Stock Market.

Several authors had reported their views on the influence of the stock market on productivity and economic growth. For example, Osei (2005) examined the relationship between stock market development and economic growth in Ghana. The result revealed a unidirectional relationship from stock market performance to economic growth.

III. Methodology

Model Design

Given the nature of this study, the study employed a quasi-experimental research design which is suitable for the social sciences. The complexities and dynamic nature of the relationships existing between the variables informed the use of quasi-experimental design. Such relationships are not subject to manipulation. Basically, the study adopted the quasi-experimental design which places emphasis on the systematic generation of the sample for the study of the relationships among the variables.

Model Specification

Model 1: Exchange Rate Volatility and Productivity Model

$OPT = f(EXRV, BOP, INTR)$ 1

The three stage least square (3SLS) form of the model can be written as:

$OPT = a_0 + a_1 EXRV + a_2 BOP + a_3 INTR + u$ 2

The log transformed form of the equation is written as:

$logOPT = a_0 + a_1 EXRV + a_2 logBOP + a_3 INTR + u.$ 3

$a_1 < 0; a_2 > 0; a_3 > 0;$

Where:

OPT	=	Output is proxy by real gross domestic product
BOP	=	Balance of payments
INTR	=	Interest rate
EXRV	=	Exchange rate volatility
a_0	=	Constant or intercept
a_1-a_3	=	Co-efficient of explanatory variables
u	=	Error term or stochastic variable

Model 11: Exchange Rate Volatility and Stock Market Performance Model

MCR= f (EXRV, BOP, INTR)   4

The three stage least square (3SLS) form of the model can be written as:

$MCR = b_0 + b_1 EXRV + b_2 BOP + b_3 INTR + u$ 5

The log transformed form of the equation is written as:

$MCR = a_0 + b_1 EXRV + b_2 logBOP + b_3 INTR + u.$ 6

$b_1 < 0; b_2 > 0; b_3 > 0;$

Where:

MCR	=	Market capitalization ratio as a proxy for stock market performance
BOP	=	Balance of payments
INTR	=	Interest rate
b_0	=	Constant or intercept
b_1-b_3	=	Co-efficient of explanatory variables
u	=	Error term or stochastic variable

Model 111: Stock Market Performance and Output Model

OPT = f (ASI, MCR, INTR)   7

The three stage least square (3SLS) form of the model can be written as:

$OPT = c_0 + c_1 ASI + c_2 MCR + c_3 INTR + u$ 8

The log transformed form of the equation is written as:

$Log\ OPT = c_0 + b_1 logASI + c_2 MCR + c_3 INTR + u$ 9

$c_1 > 0; c_2 > 0; c_3 > 0;$

Where:

OPT	=	Output measured in real gross domestic product
ASI	=	All share index as a proxy for stock market performance
MCR	=	Market capitalization ratio as a proxy for stock market performance

INTR	=	Interest rate
c_0	=	Constant or intercept
c_1-c_3	=	Co-efficient of explanatory variables
u	=	Error term or stochastic variable

Empirical Results and Discussions

Unit Root Test on Exchange Rate Volatility and Productivity Model

The Augmented Dickey Fuller (ADF) unit root test is use to establish the stationarity of the time series data used in this study. The results of the ADF unit root test below are as follows:

Table 1: ADF Unit Root Test

Variables	ADF Stat. at Levels	1% Crit. Value	5% Crit. Value	ADF Stat. at first Diff.	1% Crit. Value	5% Crit. Value	Order of integration
Log(OPT)	-0.059491	-3.615588	-2.943427	-3.692684*	-3.621023	-2.943427	I(1)
BOP	-1.543323	-3.615588	-2.943427	-5.972460*	-3.621023	-2.943427	I(1)
INTR	-2.515593	-3.615588	-2.943427	-5.723786*	-3.621023	-2.943427	I(1)
EXRV	-2.677148	-3.615588	-2.943427	-7.007108*	-3.621023	-2.943427	I(1)

Source: Computed from E-view
Note: *(**) indicates (1%) and (5%) Significant Levels

The unit root test in table above shows that all the variables are stationary at first difference [that is, I(1)] at 1% significant levels. Therefore, the time series data used in this study were stationary.

GARCH Analysis on Exchange Rate Volatility and Output Model

In order to ascertain the effect of exchange rate volatility on output, GARCH analysis was carried out. The result of the GARCH analysis is presented in table 4.3.

Table 2: GARCH Analysis on Exchange Rate Volatility and Output Model

Dependent Variable: LOG(OPT)
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Included observations: 39
Convergence achieved after 36 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
LOG(GARCH) = C(5) + C(6)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(7)
        *RESID(-1)/@SQRT(GARCH(-1)) + C(8)*LOG(GARCH(-1))

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	9.947103	0.016797	592.2021	0.0000
EXRV	-0.008171	0.002205	-3.705665	0.0035
BOP	1.08E-05	4.40E-07	24.64776	0.0000
INTR	-0.003588	0.001030	-3.483820	0.0005
		Variance Equation		
C(5)	-2.911404	1.091574	-2.667162	0.0076
C(6)	3.104929	1.031133	3.011181	0.0026
C(7)	-1.151675	0.625363	-1.841610	0.0655
C(8)	0.912037	0.205736	4.433047	0.0000
R-squared	0.524672	Mean dependent var		10.29297
Adjusted R-squared	0.483929	S.D. dependent var		0.572289

S.E. of regression	0.411121	Akaike info criterion	-0.374401
Sum squared resid	5.915725	Schwarz criterion	-0.033158
Log likelihood	15.30083	Hannan-Quinn criter.	-0.251966
Durbin-Watson stat	2.418827		

Source: Computed from E-views 10.0, 2021

From the results in table 2 above, it shows that exchange rate volatility (EXRV) has a negative coefficient and it is statistically significant at 5% level of significance. Balance of payment (BOP) has a positive coefficient and it is significant at 5% level of significance, interest rate (INTR) has a negative and significant coefficient also at 5% level of significance. The arch term sign and size of the parameter, $C(5)$ is negative (-2.911404). This means that output responds to the volatility in exchange rate in Nigeria negatively, thereby, conforming to theoretical expectations that shocks in exchange rate reduce the level of output in Nigeria. The asymmetry coefficient, $C(6)$ is positive (3.104929). This means that the variance goes up more after positive residual than after negative residual. The persistence coefficient (GARCH), $C(8)$ is very large (0.912037). This implies that the effect of today's shock remains in the forecast of variance for many periods in the future.

Hypotheses Testing on Exchange Rate Volatility and Output Model

$H0_1$: There is no significant relationship between exchange rate volatility and output level in Nigeria.

The hypothesis was tested at 5% or 0.05 level of significance with t-statistic. From the table above, t-statistic indicates that in exchange rate volatility and output model, exchange rate volatility (EXRV) has a negative significant effect on output level in Nigeria. This implies that exchange rate volatility result decline in output level in Nigeria, thus, the null hypothesis is rejected and the alternative hypothesis accepted. The above result is in line with the findings of Parker and Boxer (2021) which stated that a negative relationship exists between exchange rate volatility and productivity. Balance of payments (BOP) and interest rate (INTR) were significantly related with output level in Nigeria. Improvement in balance of payment will result in improvement in output in Nigeria, whereas an increase in the rate of interest will lead to a decline in output all things being equal in Nigeria.

Unit Root Test on Exchange Rate Volatility and Stock Market Performance Model

The Augmented Dickey Fuller (ADF) unit root test was used to establish the stationarity of the time series data used in this study. The results of the ADF unit root test are table 4.4 as follows:

Table 3: ADF Unit Root Test

Variables	ADF Stat. at Levels	1% Crit. Value	5% Crit. Value	ADF Stat. at first Diff.	1% Crit. Value	5% Crit. Value	Order of Integration
Log (MCR)	-0.748690	-3.615588	-2.943427	-4.621577*	-3.621023	-2.943427	I(1)
BOP	-1.543323	-3.615588	-2.943427	-5.972460*	-3.621023	-2.943427	I(1)
INTR	-2.515593	-3.615588	-2.943427	-5.723786*	-3.621023	-2.943427	I(1)
EXRV	-2.677148	-3.615588	-2.943427	-7.007108*	-3.621023	-2.943427	I(1)

Source: Computed from E-view
Note: *(**) indicates (1%) and (5%) Significant Levels

The unit root test in table 3 above, shows that all the variables are stationary at first difference [that is, I(1)] at 5% significant levels. Therefore, the time series data used in this study were stationary.

GARCH Analysis on Exchange Rate Volatility and Stock Market Performance Model

In order to ascertain the effect of exchange rate volatility on stock market performance, GARCH analysis was carried out. The result of the GARCH analysis is presented in table below.

Table 4: GARCH Analysis on Exchange Rate Volatility and Stock Market Performance Model

Dependent Variable: LOG(MCR)
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Sample: 1981 2019
Included observations: 39
Failure to improve likelihood (non-zero gradients) after 36 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
LOG(GARCH) = C(5) + C(6)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(7)
 *RESID(-1)/@SQRT(GARCH(-1)) + C(8)*LOG(GARCH(-1))

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	6.735553	0.416900	16.15627	0.0000
EXRV	-0.001091	0.008900	-0.122589	0.9024
BOP	3.74E-05	2.54E-06	14.73944	0.0000
INTR	-0.115790	0.024373	-4.750818	0.0000
	Variance Equation			
C(5)	-1.464554	0.675408	-2.168401	0.0301
C(6)	1.738003	0.869203	1.999536	0.0456
C(7)	-0.235506	0.470186	-0.500877	0.6165
C(8)	0.833515	0.280342	2.973207	0.0029
R-squared	0.497015	Mean dependent var		6.098368
Adjusted R-squared	0.453902	S.D. dependent var		3.106076
S.E. of regression	2.295342	Akaike info criterion		3.537314
Sum squared resid	184.4008	Schwarz criterion		3.878558
Log likelihood	-60.97763	Hannan-Quinn criter.		3.659749
Durbin-Watson stat	1.826007			

Source: Computed from E-views 10.0, 2021

From the results in table 4 above, exchange rate volatility (EXRV) has a negative coefficient but it is not statistically significant. The result of the arch term sign and size of the parameter, C(5) is negative (-1.464554). This means that stock market performance is a negative function of the volatility in exchange rate in Nigeria, thereby, conforming to theoretical expectations that shocks in exchange rate reduce the performance of the stock market in Nigeria. The asymmetry coefficient, C(6) is positive (1.738003). This means that the variance goes up more after positive residual than after negative residual. The persistence coefficient (GARCH), C(8) is very large (0.833515). This implies that the effect of today's shock remains in the forecast of variance for many periods in the future.

Hypotheses Testing on **Exchange Rate Volatility and Stock Market Performance Model**

H0$_2$:   There is no significant relationship between exchange rate volatility and stock market performance in Nigeria.

The hypothesis was tested at 5% or 0.05 level of significance with t-statistic. From the table above, t-statistic indicates that in exchange rate volatility and stock market performance model, exchange rate volatility (EXRV) has a negative coefficient but it is insignificant on stock market performance in Nigeria, the result is in conformity with the work of Brader 2018. But balance of payments (BOP) and interest rate (INTR) were significantly related with stock market performance in Nigeria. An increase in balance of balance of payment will result increase in stock market performance in Nigeria all things being equal. An increase in interest rate will lead to a decline in stock market performance in Nigeria all things being equal,

Regression Estimates on Stock Market Performance and Output Model

The regression estimates on stock market performance and productivity model are presented as follows:

Unit Root Analysis on Stock Market Performance and Output Model

The Augmented Dickey Fuller (ADF) unit root test was used to establish the stationarity of the time series data used in this study. The results of the ADF unit root test are table 4.6 as follows:

Table 5: ADF Unit Root Test

Variables	ADF Stat. at Levels	1% Crit. Value	5% Crit. Value	ADF Stat. at first Diff.	1% Crit. Value	5% Crit. Value	Order of integration
Log(PDV)	-0.059491	-3.615588	-2.943427	-3.692684*	-3.621023	-2.943427	I(1)
Log (MCR)	-0.748690	-3.615588	-2.943427	-4.621577*	-3.621023	-2.943427	I(1)
ASI	-1.299901	-3.615588	-2.943427	-6.451769*	-3.621023	-2.943427	I(1)
INTR	-2.515593	-3.615588	-2.943427	-5.723786*	-3.621023	-2.943427	I(1)

Source: Computed from E-view
Note: *(**) indicates (1%) and (5%) Significant Levels

The unit root test in table 5 above, shows that all the variables are stationary at first difference [that is, I(1)] at 5% significant levels. Therefore, the time series data used in this study were stationary.

Johansen Cointegration Test on Stock Market Performance and Output Model

In order to ascertain whether a long run equilibrium relationship exist between the dependent and explanatory variables in the Stock Market Performance and Output Model, the Johansen cointegration test was carried out. The result is in tables 4.7.

Table 6: Johansen Cointegration on Stock Market Performance and Output Model

Series: LOG(OPT) LOG(MCR) ASI INTR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.458933	48.69496	47.85613	0.0416
At most 1*	0.316524	35.96914	29.79707	0.0526
At most 2	0.237881	11.88828	15.49471	0.1624
At most 3	0.048440	1.837159	3.841466	0.1753

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.458933	42.72582	27.58434	0.0515
At most 1	0.316524	14.08086	21.13162	0.3584
At most 2	0.237881	10.05112	14.26460	0.2086
At most 3	0.048440	1.837159	3.841466	0.1753

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Computed from E-views 10.0, 2021

From the result in table 6 above, trace and max-eigen statistics indicate 2 and 1 cointegrating equations respectively. This means that a long run equilibrium relationship exists between the dependent and explanatory variables in the real GDP model.

4.4.3   Error Correction Mechanism Model on Stock Market Performance and Output Model

In order to adjust for the short run, the ECM model that established relationship between stock market performance and output level in Nigeria was estimated as follows:

Table 7: Parsimonious ECM Estimates on Stock Market Performance and Output Model

Dependent Variable: LOG(OPT)
Method: Least Squares
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.201159	0.110458	83.29998	0.0000
LOG(MCR)	0.350911	0.084394	4.158000	0.0014
LOG(MCR(-2))	0.226238	0.079324	2.852070	0.0232
ASI	3.79E-04	3.97E-06	3.095438	0.0047
ASI(-2)	2.13E-06	3.21E-06	0.663580	0.5126
INTR	0.010564	0.004913	2.150355	0.0406
INTR(-3)	-0.008475	0.005877	-1.442021	0.1608
ECM(-1)	-0.873151	0.225481	-3.872397	0.0006

R-squared	0.874732	Mean dependent var		10.37461
Adjusted R-squared	0.768181	S.D. dependent var		0.546727
S.E. of regression	0.097524	Akaike info criterion		-1.619812
Sum squared resid	0.256793	Schwarz criterion		-1.264303
Log likelihood	36.34670	Hannan-Quinn criter.		-1.497090
F-statistic	148.7944	Durbin-Watson stat		1.805950
Prob(F-statistic)	0.000000			

Source: Source: Computed from E-views 10.0, 2021.

From the results in table 7 above, Adjusted R^2 is 0.768181. This means that about 77% of the variation in the dependent variable is as a result of the variations in the explanatory variables. The remaining 23% may be attributed to the variables that are not included in the model. The F-statistic of 148.7944 indicates that the overall model is statistically significant at 5 percent (%) level. The result of DW-statistic of 1.805950 shows no autocorrelation of the error term in the ECM. This means that the estimates based on OLS is not spurious. The value of the ECM is-0.873151 which indicates 87% speed of adjustment to short run dynamics. The apriori

expectations show that market capitalization (MCR) and all share index (ASI) were rightly signed. This implies that increase in market capitalization (MCR) and all share index (ASI) will bring about increase in the level ofoutput in Nigeria. The above result is in tandem with the finding of Kelvin (2019) who stated that stock market development has positive impact on productivity in Nigeria. On the other hand, interest rate (INTR) at current period has positive relationship with the level of output but is not rightly signed. This is not in line with theoretical apriori expectations. The failure of INTR to improve the level of productivity may be attributed to high level of high interest rate in Nigeria.

Hypotheses Testing on Stock Market Performance and Output Model

H0₃: There is no significant relationship between stock market performance and output in Nigeria.

The hypothesis was tested at 5% or 0.05 level of significance with t-statistic. From table 4.8, t-statistic indicates that in the stock market performance and output model, market capitalization (MCR) one of the proxies for stock market performance at both level and lag period two positively affected output in Nigeria and it is significant. Percentage increase in market capitalization at both level and lag period two will increase output by 0.35 and 0.22 all things being equal in Nigeria. All share index (ASI) another proxy for stock market performance has a positive coefficient and significant effect on output level in Nigeria. But interest rate (INTR) is significantly related with productivity in Nigeria. Thus, the null hypothesis that stated that there is no significant relationship between stock market performance and productivity is rejected, and the alternative hypothesis accepted.

Discussion of Findings

This study examined the relationship between exchange rate volatility, stock market performance and output in Nigeria. Based on the results or from the regression estimates on exchange rate volatility and output model, it was revealed that exchange rate volatility result in a decline in output level and that shocks in exchange rate also reduce the level of output in Nigeria. The hypothesis tested proved that exchange rate volatility was statistically significant with the level of output in Nigeria. Thus, the null hypothesis is rejected and the alternative hypothesis accepted.

From the regression estimates on exchange rate volatility and stock market performance model, it was revealed that exchange rate volatility is high and that shocks in exchange rate reduce the level of stock market performance in Nigeria. The hypothesis tested proved that exchange rate volatility was statistically insignificant with stock market performance.

Also, from the regression estimates on stock market performance and output model, it was revealed that market capitalization (MCR) and all share index (ASI) were rightly signed. This implies that increase in market capitalization (MCR) and all share index (ASI) improve the level of output in Nigeria. On the other hand, interest rate (INTR) is not rightly signed. This is not in line with theoretical apriori expectations. The failure of INTR to improve the level of output may be attributed to high level of high interest rate in Nigeria. The hypothesis tested proved that stock market performance was statistically insignificant with the level of output.

Conclusion/ Recommendations
Following the findings, the study draws the conclusions that high volatility in exchange rate (EXRV) appeared to generate great shocks on the performance of stock market and also reduce the level of output in Nigeria. The policy implication is that there is need to properly manage the volatility in exchange rates in Nigeria. There must be improvement in investment environment to boost the performance of stock market in Nigeria.

Based on the conclusions and findings of the study, the following recommendations are made for policy

(i)   The government should adopt appropriate macroeconomic policies to cushion the effect of exchange rate volatility so as create investment friendly environment that has the capacity to boost investment. This will help to guarantee employment generation, maintain high level of productivity and boost the performances of all the sectors of the economy for rapid economic development in Nigeria.
(ii)   There should be proper coordination of fiscal and monetary policies that target the improvement of the performance of the stock market in the country. This will spur high level of output and boost development in Nigeria.
(iii)   Given the volatile nature of exchange rate the government should adopt a fixed exchange rate as to checkmate its volatile nature.

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