


EXCHANGE RATE VOLATILITY AND NIGERIAN STOCK MARKET DEVELOPMENT

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 09 June 2023</p> <p>Accepted 06 September 2023</p>	<p>Purpose: The study aims to evaluate the impact of exchange rate volatility on the indicators of stock market, such as the returns, capitalization, liquidity, transaction volume, based on the Nigerian evidence.</p>
<p>Keywords:</p> <p>Exchange Rate Volatility; Stock Returns; Stock Market Capitalization; Stock Market Liquidity; Transaction Volume; Static Regression; Autoregressive Adjustment.</p>	<p>Theoretical framework: The paper considers extant model of exchange rate-stock market interactions. Because the diversity of the market is important the paper follows suggestions by El-Wassal (2013) to examine variety of stock market indicators in order to offer accurate depiction of how the stock market drives exchange rate volatility.</p> <p>Design/Methodology/Approach: The study employs a simple static regression model of stock market indicators with autoregressive adjustment component which absorb autocorrelation. The models are tested on annual data (1985-2020).</p> <p>Findings: The study finds that the exchange rate volatility has negative impact on stock market development - returns, capitalization and volume. The paper reveals further that other correlated controls factors impinge different impacts on the stock market indicators.</p>
	<p>Research, Practical & Social implications: One implication of the finding is that the volatility may discourage investors, reduce firm performance, and lead to reduction on the returns of firm shares. Policy makers should put in place growth-inducing infrastructural investments to make the business environment more conducive to attract foreign capital, while also positioning the capital market with several initiatives to increase trading activities.</p> <p>Originality/Value: The connection between the foreign exchange and financial markets is of policy importance. Although the focus is on the Nigerian markets, the evidence could be extended to other African and global markets, to serve as guide to foreign investors.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i9.3078</p>

VOLATILIDADE CAMBIAL E DESENVOLVIMENTO DO MERCADO BOLSISTA NIGERIANO

RESUMO

Objetivo: O estudo tem como objetivo avaliar o impacto da volatilidade da taxa de câmbio sobre os indicadores do mercado acionista, tais como retornos, capitalização, liquidez, volume de transações, com base nos dados nigerianos.

Estrutura teórica: O documento considera o modelo existente de interações entre taxa de câmbio e mercado de ações. Como a diversidade do mercado é importante, o artigo segue sugestões de El-Wassal (2013) para examinar uma variedade de indicadores do mercado de ações, a fim de oferecer uma descrição precisa de como o mercado acionário impulsiona a volatilidade da taxa de câmbio.

Design/Methodologia/Abordagem: O estudo emprega um modelo de regressão estática simples de indicadores do mercado de ações com componente de ajuste autorregressivo que absorve a autocorrelação. Os modelos são testados em dados anuais (1985-2020).

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Conclusões: O estudo conclui que a volatilidade da taxa de câmbio tem um impacto negativo no desenvolvimento do mercado acionista - retornos, capitalização e volume. O documento revela ainda que outros fatores de controle correlacionados têm impactos diferentes nos indicadores do mercado de ações.

Investigação, Implicações práticas e Sociais: Uma implicação da conclusão é que a volatilidade pode desencorajar os investidores, reduzir o desempenho da empresa e levar a uma redução no retorno das ações da empresa. Os decisores políticos devem pôr em prática investimentos infraestruturais que induzam o crescimento, a fim de tornar o ambiente empresarial mais propício para atrair capital estrangeiro, posicionando simultaneamente o mercado de capitais com várias iniciativas para aumentar as atividades comerciais.

Originalidade/Valor: A ligação entre os mercados cambiais e financeiros é de importância política. Embora o foco esteja nos mercados nigerianos, a evidência poderia ser estendida a outros mercados africanos e globais, para servir como guia para investidores estrangeiros.

Palavras-chave: Volatilidade da Taxa de Câmbio, Retornos de Ações, Capitalização do Mercado de Ações, Liquidez do Mercado de Ações, Volume de Transações, Regressão Estática, Ajuste Autorregressivo.

VOLATILIDAD DEL TIPO DE CAMBIO Y EVOLUCIÓN DEL MERCADO DE VALORES DE NIGERIA

RESUMEN

Objetivo: El estudio tiene como objetivo evaluar el impacto de la volatilidad del tipo de cambio sobre los indicadores del mercado de valores, tales como los rendimientos, la capitalización, la liquidez, el volumen de transacciones, sobre la base de la evidencia nigeriana.

Marco teórico: El artículo considera el modelo existente de interacciones entre el tipo de cambio y el mercado de valores. Debido a la importancia de la diversidad del mercado, el artículo sigue las sugerencias de El-Wassal (2013) para examinar una variedad de indicadores bursátiles con el fin de ofrecer una descripción precisa de cómo el mercado de valores impulsa la volatilidad del tipo de cambio.

Diseño/Metodología/Enfoque: El estudio emplea un modelo de regresión estática simple de indicadores bursátiles con componente de ajuste autorregresivo que absorbe la autocorrelación. Los modelos se prueban con datos anuales (1985-2020).

Conclusiones: El estudio concluye que la volatilidad del tipo de cambio tiene un impacto negativo en la evolución del mercado de valores: rendimientos, capitalización y volumen. El trabajo revela además que otros factores de control correlacionados inciden en diferentes impactos sobre los indicadores del mercado de valores.

Investigación, Implicaciones prácticas y Sociales: Una implicación del hallazgo es que la volatilidad puede desalentar a los inversores, reducir el desempeño de las empresas y conducir a una reducción en los retornos de las acciones de las empresas. Los encargados de la formulación de políticas deben realizar inversiones en infraestructura que estimulen el crecimiento a fin de que el entorno empresarial sea más propicio para atraer capital extranjero, y al mismo tiempo situar el mercado de capitales con varias iniciativas para aumentar las actividades comerciales.

Originalidad/Valor: La conexión entre el mercado de divisas y los mercados financieros es de importancia política. Aunque la atención se centra en los mercados nigerianos, la evidencia podría extenderse a otros mercados africanos y globales, para servir como guía a los inversores extranjeros.

Palabras clave: Volatilidad del Tipo de Cambio, Rendimientos de las Acciones, Capitalización Bursátil, Liquidez del Mercado de Valores, Volumen de Transacciones, Regresión Estática, Ajuste Autorregresivo.

INTRODUCTION

The connection the foreign exchange and financial markets have evidently grown due to increased global trade, capital inflows and foreign direct investments investors Studies show that the stock and currency fluctuations market have a central role in the economy, especially the developing ones (Subair & Salihu, 2010; Khosa et al., 2015; Najafzadeh et al. 2016; Cevik et al., 2016; Yip et al., 2020; David & Grobler, 2020; Haryono & Atika, 2023). Haryono and

Atika (2023) note that evaluating the effect of stock market provide market participants references that serve as guide to invest in making decisions on profitable securities portfolio. Ehrmann, Fratzscher and Rigobon (2011) observe that since the US markets drive other global financial markets, its activities can determine the exchange rates of the dollar and influence stocks in emerging markets. Some evidence suggest that exchange rate swings play significant role in causing volatility in emerging stock markets (Tule et al., 2018; Vo & Tran, 2020; Yip et al., 2020).

There is evidence for Nigeria based on established econometric methods (Evbayiro-Osagie & Emeni, 2015; Oyinpreye & Karimo, 2015; Nkoro & Uko, 2016). They examine the relation between the volatility of the naira and stock prices, alongside other macroeconomic variables. Nkoro and Uko (2016)'s evidence reveals negative relationship between exchange rate and stock price. Oyinpreye and Karimo (2015) identify that exchange rate volatility has a significant negative impact on share price, and Evbayiro-Osagie and Emeni (2015) show negative impact of exchange rate on stock returns. The studies ignore the multi facet dimension of stock market development beyond price. El-Wassal (2013) argues the need to verify variety of stock market development indicators because these measures better depiction the market dynamics. Moreso, including market diversities dynamics is important because the stock market may be large, yet not liquid, and sometimes liquid with trading saturating around small number of stocks which constitute substantial fragment of the market capitalization. This paper examines the relation for Nigeria, capturing the different diversity of the Nigeria Stock Exchange (NSE).

The intense capital inflows in past decades has resulted in large volatility of the exchange rates (Mlambo et al., 2013; Khosa, Botha & Pretorius, 2015; Alegwu et al., 2017; Adekunle et al., 2022; Gbadebo, 2023) and its tremendous impacts on stock market (Evbayiro-Osagie & Emeni, 2015; Oyinpreye & Karimo, 2015; Nkoro & Uko, 2016). Because of these occurrences, some important 'how' questions must be avail for tests, including to find for the Nigeria - how does the exchange rate volatility affects stock market returns? How the exchange rate volatility influences the stock market capitalization? How naira volatility impacts stock market liquidity, and lastly, how exchange rate volatility impacts the transactions volume, all in the Nigeria market. To attempt these, the paper pursues each associated o the identified question - (a) access the impact of exchange rate volatility on stock market returns (b) determine how exchange rate volatility affect stock market capitalization (c) establish the impact of

exchange rate volatility on stock market liquidity, and (d) evaluate how exchange rate volatility on volume of transactions in the stock market.

For the aim, the study uses four models and applies a simple least square approach to show the links between stock market indicators and exchange rate volatility, alongside controlling for considered financial and macroeconomic indicators. The inclusion of these correlated controls is necessary since market volatility interacts with various effects across the financial sectors and real economy (Tule et al., 2018). Due to the approach applied, the paper must avoid spurious regression, and present suitable estimates for policy purposes. Hence, the initial estimations for the stock- returns, capitalization, liquidity and transaction volume, are adjusted according to included autoregressive schemes. The paper finds the direction of volatility transmission effect –whether unidirectional or bidirectional– between stock indicators and the exchange rate fluctuation measure.

The paper finds evidence that naira volatility has weak but significant negative correlation with stock market capitalization and transaction volume. The findings suggest that several policy steps can be implemented to position the capital market to gain from the volatility of the naira-dollar rate, while simultaneously ensuring measures to curb excessive swings overtime. The paper project what the direction of policy should be as regards altering the considered explanatory variables to drive market growth and development. In sum, policy mix wherein exchange rate management strategies are augmented with import substitution and export promotion strategies, as well as growth-inducing infrastructural investments to make business environment more conducive are offered. The paper's other structure involves: Section 2, 3, 4 and 5 which are the literature, methodology, results and conclusions, respectively.

LITERATURE

Some studies depict the considered relationship between exchange rate volatility and stock price or its volatility, while controlling for cofounding financial factors for Nigeria (Khan & Ali, 2015; Najafzadeh et al., 2016; Kennedy & Nourizad, 2016; Sichoongwe, 2016). Al-Smadi et al. (2023) completes that the fluctuations of exchange rate was unable to impact the returns of the Jordanian stock exchange. Khan and Ali (2015) use Pakistan monthly data (1992:M1-2013:M2) to show the causality between exchange rate and stock prices, and identify a bidirectional relationship between the rupee-dollar volatility and stock prices.

Based on a Panel-GARCH, Najafzadeh et al. (2016) use monthly data from 2008:M1 to 2015:M6 to examine the relation for D8 countries, and identify a significant positive impact of

exchange rate volatility on stock return in Bangladesh, Indonesia, Iran and Pakistan. Inflation and oil price (while interest rate and gold price) have significant negative (positive) effects on stock returns. Kennedy and Nourizad (2016) use GARCH models on weekly data from 1999:W1 to 2010:W3 and find that exchange rate volatility, broad money as well as a lagged period of stock volatility exerts significant positive impact stock market volatility. The GARCH estimation identifies that the exchange rate volatility as well as the the 9/11 terrorist attack, negative equity market returns, and the bear markets, all exert significant positive effect on stock returns.

Sichoongwe (2016) use the GARCH model on annual data for Zambian market, during 2000-2015. The estimation results indicate that exchange rate volatility exerts a significant negative impact in stock market capitalization. Sikhosana and Aye (2018) use monthly South African data on different GARCH models to examine asymmetric volatility spillover effect between exchange rate and stock returns, and find bidirectional volatility spillover effect in the short-run, although the negative shocks in the rand's market have more influence on stock market volatility. Vo and Tran (2020) investigate spillovers from US equity market to the stock markets of ASEAN economies. The applies augmented EGARCH models and control for volatility breaks of long period and find a significant volatility spillover from the US to ASEAN equity markets.

In the domestic context, some studies considered the relationship for Nigeria (Nkoro & Uko, 2016; Oyinpreye & Karimo, 2015; Evbayiro-Osagie & Emeni, 2015; Lawal & Ijirshar, 2015; Umoru & Asekome, 2013). Nkoro and Uko (2016), Oyinpreye and Karimo (2015), Evbayiro-Osagie and Emeni (2015) employ the GARCH approach. Nkoro and Uko (2016) use quarterly data between 1986Q1-2012Q4, indicates 3 cointegrating equations implying existence of equilibrium, and finds significant negative relationship between the naira exchange rate and stock price. Oyinpreye and Karimo (2015) test the relation for monthly dataset spanning 1985:M1-2012:M4 and show that the naira rate is volatile and responds to information shock. The variance equation of the GARCH indicates that the volatility has a significant negative impact on the share price and Granger shows unidirectional run from price to exchange rate. Evbayiro-Osagie and Emeni (2015) consider quarterly data during 1985-2012. The variance equation shows significant negative impact of current values of inflation, and exchange rate on stock returns. A significant negative impact of previous period values of inflation rate and exchange rate on returns was recovered. An insignificant negative impact of

changing inflation rate and financial openness on stock market volatility, while changing exchange rate exerts an insignificant positive impact on stock returns volatility.

Subair and Salihu (2010) and Olugbenga (2012) use the ECM and the cointegration approach. Olugbenga (2012) tests quarterly data from 1985:1-2009:4 and identifies significant positive impact of current and previous exchange rate on share price. Subair and Salihu (2010) verifies annual data from 1981-2007 and find equilibrium relationship, as well as a significant negative impact of exchange rate volatility, interest rate, and inflation rate on stock market capitalization, while gross domestic product was found to have a significant positive impact on stock market capitalization.

METHODOLOGY

The study uses annual dataset spanning 36 years, from 1985 to 2020. The time frame was chosen due to the non-existence of data on the all share index prior to 1985. Data are obtained from the Central Bank of Nigeria (CBN) and the World Bank Development Indicators.

The paper adopts four log-linear models to capture the impact of exchange rate (USD/NGN) volatility on the stock market development indicators. Capturing the diversity of the market is important because the stock market may be large, yet not liquid, and sometimes liquid with trading in small number of stocks, accounting for substantial fragment of total capitalization. Hence, as noted (El-Wassal, 2013), examining variety of indicators of stock market development offers accurate depiction of how the multi-faceted stock market development drives exchange rate volatility. The econometric specifications of the considered models are specified by equation 1 - 4:

$$RETN_t = \alpha_0 + \alpha_1 XVOL_t + \alpha_2 NGDP_t + \alpha_3 FFDI_t + \alpha_4 BSDV_t + \alpha_5 DINV_t + e_{1t} \quad (1)$$

$$SCAP_t = \beta_0 + \beta_1 XVOL_t + \beta_2 NGDP_t + \beta_3 FFDI_t + \beta_4 BSDV_t + \beta_5 DINV_t + e_{2t} \quad (2)$$

$$MLIQ_t = \theta_0 + \theta_1 XVOL_t + \theta_2 NGDP_t + \theta_3 FFDI_t + \theta_4 BSDV_t + \theta_5 DINV_t + e_{3t} \quad (3)$$

$$TVOL_t = \phi_0 + \phi_1 XVOL_t + \phi_2 NGDP_t + \phi_3 FFDI_t + \phi_4 BSDV_t + \phi_5 DINV_t + e_{4t} \quad (4)$$

Equation 1, 2, 3, and 4, which respectively represent models for stock market return, stock market capitalization, stock market liquidity, and the market transaction volume, are the four indicators and models of stock market development. The all share index return (RETN), ratio of stock market capitalization to nominal (SCAP), ratio of the total value of shares traded

to GDP (MLIQ), and value of shares traded (MVOL), are adopted as proxies stock returns, stock market size, stock market liquidity, volume of transactions traded on the stock exchange. RETN is computed as:

$$RETN_t = 100 * (Ending Index_t - Starting Index_t) / Starting Index_t \quad (5)$$

The key explanatory variable is exchange rate volatility (XVOL) and the first difference approach is used to compute a proxy. The nominal gross domestic product (NGDP), foreign direct investment (FFDI), bank lending rate (BLRT) and gross fixed capital formation (GFCF) are used as proxies, respectively, for economy size, foreign investment, banking sector development and domestic investment, which the paper controls for.

Many studies establish long run relationship (Subair & Salihu, 2010; Olugbenga, 2012; Umoru & Asekome, 2013). The paper captures simple static long run model and adjusts it for autocorrelation with an AR scheme. The variables are log-transformed, and the estimation, using least square regression, depicts the double-log framework. Model 1-4 are estimated based on the OLS. The estimations are analyzed according to the different criteria - sign expectations, significance (t) test, model's overall significance (F-test) and model's explanatory ability (R-squared), Durbin-Watson (DW-statistic) and diagnostic tests. The necessary adjustment is made to correct for violated econometric assumption.

RESULTS AND DISCUSSION

Basic Statistics

Table 1 records the basic statistics for the study's variables. Amongst the dependent variables, market return averages 2.34% with variability (standard deviation) of 3.11%. For a stock capitalization to NGDP ratio's mean (variability) of 11.25% (8.61%), the capital market is evidently small relative to the economy. The proxy for stock liquidity, value of shares trade's ratio, has mean (standard deviation) of 0.86% (1.02%) signifying low trading degree compare to the overall economy as well as the trading activity on stock markets in other emerging and advanced economies. The Jarque-Bera tests show that among the dependent variables, stock market return has normal distribution. Amongst independent variables, exchange rate volatility averages -3.007, and FFDI averages USD2.99billion. The proxy for banking sector development, bank lending rate, averages 18.53% and proxy for domestic investment, gross fixed capital formation (GFCF), averages NGN4.99 trillion. The normality tests show that FDI, lending rate and GFCF, are normally distributed.

Table 2 records the correlation amongst the model's variables. A number of relationships exist, including that the market return has: significant moderate negative correlation with market capitalization (-0.481; $p < 0.01$), significant strong negative correlations with market liquidity (-0.616; $p < 0.01$) and market transaction volume (-0.597; $p < 0.01$). Stock market capitalization has significant strong positive correlations with market liquidity (0.893; $p < 0.01$) and transaction volume (0.963; $p < 0.01$). Market liquidity has significant strong positive correlation with transaction volume (0.928; $p < 0.01$). The market return has - insignificant strong positive correlation with exchange rate volatility (0.789), significant negative correlations with GDP (-0.520), FDI (-0.487) and domestic investment (-0.453). A weak insignificant correlation is evident between - returns and banking sector development (0.079), market capitalization and banking sector development (-0.174). Exchange rate volatility shows significant negative correlation of -0.433 with market capitalization, and, of 0.382 with transaction volume.

How Exchange Rate Volatility Impacts Stock Market Returns

Table 3 records the estimation results for the equation 1. When controlling for considered variables, the estimation with the AR scheme (Panel B) shows evidence that exchange rate volatility (been negative) and both banking sector development and domestic investment (been positive), are well-signed. In contrast, the gross domestic product and foreign direct investment are inconsistent with signs expected. The result shows that a 1% increase in exchange rate volatility causes 2.643% decrease in market returns. Controlling for associated macroeconomic and financial factors, the evidence reveals that a 1% increase in the gross domestic product (foreign direct investment) reduces the return by 0.644% (2.014%). The market return increases by 9.325% (2.989%) for a 1% increase in banking lending rate (domestic investment). Except for the economic size, all considered variables are significance at 0.05 level. The overall model is significant and model has robust explanatory power (64%). The AR scheme corrects the returns' associated autocorrelation.

Table 1: Basic statistics

Z_k	μ	<i>med</i>	σ	$\tilde{\mu}_3$	$\tilde{\mu}_4$	<i>JB</i>	Pr_{JB}
RETN _t (1)	2.336	2.738	3.106	0.026	3.335	0.153	0.926
SCAP _t (2)	11.49	7.209	8.613	1.351	4.955	14.835	0.001
MLIQ _t (3)	0.865	0.466	1.018	1.808	5.998	29.415	0.000
MVOL _t (4)	380.5	42.92	580.1	1.764	5.738	26.593	0.000
XVOL_t (5)	-3.007	-3.116	0.315	2.504	9.572	91.015	0.000
NGDP_t (6)	25.117	7.515	3.147	1.163	2.957	7.217	0.027
FFDI_t (7)	2.991	1.999	2.461	0.910	2.497	4.756	0.093

BLRT_t (8)	18.523	17.927	4.163	0.513	4.260	3.521	0.172
GFCF_t (9)	4.992	2.622	3.215	0.980	2.289	5.799	0.055

Note: Table 1 provides the basic statistics, including the mean (μ), median (med), standard deviation (σ), skewness (μ_3) and kurtosis (μ_4) coefficients, Jarque-Bera (JB) and probability of JB (Pr_{JB}), of the considered variables. The variable, denoted Z_k (for $k=1$ to 9), is identified for k . Bold variables are the study's independent variables.
Source: Authors (2023)

Table 2: Pearson correlations

Z_k	1	2	3	4	5	6	7	8	9
1	1	-0.481** (0.005)	-0.616** (0.000)	-0.597** (0.000)	0.049 (0.789)	-0.520** (0.002)	-0.487** (0.005)	0.316 (0.079)	-0.453** (0.009)
2	-0.481** (0.005)	1	0.893** (0.000)	0.963** (0.000)	-0.433* (0.013)	0.923** (0.000)	0.875** (0.000)	-0.174 (0.340)	0.816** (0.000)
3	-0.616** (0.000)	0.893** (0.000)	1	0.928** (0.000)	-0.317 (0.077)	0.781** (0.000)	0.735** (0.000)	-0.296 (0.100)	0.672** (0.000)
4	-0.597** (0.000)	0.963** (0.000)	0.928** (0.000)	1	-0.382* (0.031)	0.957** (0.000)	0.869** (0.000)	-0.132 (0.472)	0.802** (0.000)
5	0.049 (0.789)	-0.433* (0.013)	-0.317 (0.077)	-0.382* (0.031)	1	-0.401* (0.023)	-0.445* (0.011)	0.090 (0.622)	-0.298 (0.097)
6	-0.520** (0.002)	0.923** (0.000)	0.781** (0.000)	0.957** (0.000)	-0.401* (0.023)	1	0.885** (0.000)	0.007 (0.971)	0.824** (0.000)
7	-0.487** (0.005)	0.875** (0.000)	0.735** (0.000)	0.869** (0.000)	-0.445* (0.011)	0.885** (0.000)	1	0.062 (0.736)	0.783** (0.000)
8	0.316 (0.079)	-0.174 (0.340)	-0.296 (0.100)	-0.132 (0.472)	0.090 (0.622)	0.007 (0.971)	0.062 (0.736)	1	-0.204 (0.263)
9	-0.453** (0.009)	0.816** (0.000)	0.672** (0.000)	0.802** (0.000)	-0.298 (0.097)	0.824** (0.000)	0.783** (0.000)	-0.204 (0.263)	1

Note: The variable is denoted Z_k (for $k=1$ to 9), as identified in Table 2 (Column 1). The Figures in parathesis are the Significance (2-tailed); Bold coefficients refer to relationship between two study's independent variables.
* (**) Correlation is significant at the 0.05 (0.01) level (2-tailed).
Source: Authors (2023)

How Exchange Rate Volatility Impacts Stock Market Capitalization

Table 4 records the estimation for equation 2. The evidence supposes that naira dollar rate volatility exerts a negative impact on stock capitalization in line with Sichoongwe (2016), who find same for Zambian market. Both gross domestic product and foreign direct investment (banking sector development and domestic investment) were found to be positively (negatively) signed as expected (against expectations). A 1% increase in naira rate volatility, banking sector development, domestic investment (gross domestic product and FDI) would, respectively, reduce (increase) stock market capitalization by 0.049%, 0.668% and 0.016% (0.252% and 0.218%). The gross domestic product, foreign direct investment, banking sector development and domestic investment are statistically significant, as such reliable predictors of capitalization. The relationship with GDP is consistent with studies by Subair and Salihu (2010), that found significant positive impact on stock market capitalization in Nigeria. The exchange rate volatility is insignificance to drive market capitalization. The model is associated with high explanatory power, supposing 95% of variations in capitalization is driven by the

confounding and controlled factors. The overall model is highly significant and well fitted to explain the capitalization. The AR scheme corrects the capitalization's autocorrelation.

How Exchange Rate Volatility Impacts Stock Market Liquidity

Table 5 records the estimation for equation 3. The evidence supposes that naira dollar rate volatility impinges positively impacts on contrary to expectation. The controlled variables are not all well signed – gross domestic product and foreign direct investment (banking sector development and domestic investment) impact positive (negative) influence according to (against) expectations. A percent increase in exchange rate volatility, gross domestic product and domestic investment (banking sector development and domestic investment) would, respectively, increase (reduce) the market liquidity by 0.021%, 0.421% and 0.314% (0.876% and 0.1738%). But, only 49% of the variations in market liquid is explained by the correlated controlled factors. The overall model is robustly fitted, significant and the AR scheme adjust liquidity's residuals autocorrelation.

How Exchange Rate Volatility Impacts Market Transaction Volume

Table 5 records estimation for equation 4. The evidence reveals that exchange rate volatility impinges negative impact on the transaction volume consistent with expectation. The gross domestic product and foreign direct investment (banking sector development and domestic investment) positively (negatively) affect the transaction volume, according to (against) expectations. With a 1% increase in gross domestic product and foreign direct investment (exchange rate swings, banking sector development and domestic investment), the transaction volume would increase (reduce) by 0.568% and 0.023% (0.020%, 0.866% and 0.181%). The model indicates a good fit, almost 95% of the variations in market transaction volume is driven by the correlated factors. The overall model is robust and significant and the AR scheme adjust volume's residuals autocorrelation.

Diagnostics

Table 7 report statistics for the autocorrelation and heteroskedasticity tests. The tests show that for estimated- market return, stock capitalization, market liquidity and transaction volume models, the residuals replicate no autocorrelated (Heteroskedasticity), therefore, the null holds for the Breusch-Godfrey Serial Correlation LM (Breusch-Pagan-Godfrey Heteroskedasticity) test for the OLS residuals of stock capitalization and the residuals of the

other three AR scheme adjusted estimations. Both tests are completed at 0.05 significance. Where $\Pr(\text{Obs}*[R^2]) > 0.05$, then the null holds for the considered tests. Evidently, the null is retained all 4 models. The absence of both autocorrelation and heteroscedasticity implies that the empirical results obtained are meaningful and not spurious regression results.

Table 3: Stock market return model (RETN_t)

Z_k	Coef & Apr	Est.	σ	Pr(t)	Est.	σ	Pr(t)
		Panel A: Model (without AR)			Panel B: Model (with AR)		
Const.	α_0^+	-21.016	41.261	0.005	-35.23	14.138	0.001
XVOL_t	α_1^-	-2.088	1.463	0.078	-2.643	2.015	0.024
NGDP_t	α_2^+	-0.680	0.615	0.215	-0.644	0.502	0.211
FFDI_t	α_3^+	-1.151	1.082	0.098	-2.014	0.439	0.023
BLRT_t	α_4^+	6.556	2.261	0.004	9.325	2.881	0.000
GFCF_t	α_5^+	1.819	1.509	0.006	2.989	1.318	0.001
AR_{t-3}					-0.387	0.210	0.024
Statistics							
R²				0.612			0.639
F-stat.				5.957			6.942
Pr(F-stat.)				0.000			0.000
DW-stat.				1.082			2.251

I-AR Roots

0.37 – 0.65i

*p-value of t-value of coefficient and F-statistic < 0.05, **p-value of t-value of coefficient and F-statistic < 0.01.

Source: Authors (2023)

Table 4: Stock market capitalization model (SCAP_t)

Z_k	Coef & Apr	Est.	σ	Pr(t)
Const.	β_0^+	-4.189	4.171	0.000
XVOL_t	β_1^-	-0.049	0.167	0.152
NGDP_t	β_2^+	0.218	0.054	0.000
FFDI_t	β_3^+	0.252	0.106	0.001
BLRT_t	β_4^+	-0.668	0.223	0.000
GFCF_t	β_5^+	-0.016	0.152	0.086
Statistics				
R²				0.951
F-stat.				65.82
Pr(F-stat.)				0.000
DW-stat.				2.081

*p-value of t-value of coefficient and F-statistic < 0.05, **p-value of t-value of coefficient and F-statistic < 0.01.

Source: Authors (2023)

Table 5: Stock market liquidity model (MLIQ_t)

Z_k	Coef & Apr	Est.	σ	Pr(t)	Est.	σ	Pr(t)
		Panel A: Model (without AR)			Panel B: Model (with AR)		
Const.	θ_0^+	6.179	12.408	0.623	1.933	16.441	0.207
XVOL_t	θ_1^-	0.386	0.496	0.443	0.021	0.275	0.539
NGDP_t	θ_2^+	0.434	0.160	0.012	0.421	0.331	0.016
FFDI_t	θ_3^+	0.534	0.314	0.102	0.314	0.195	0.097
BLRT_t	θ_4^+	-2.236	0.664	0.002	-0.876	0.575	0.216
GFCF_t	θ_5^+	-0.531	0.451	0.249	-0.173	0.562	0.410
AR_{t-1}	-				0.820	0.140	0.000
Statistics							
R²				0.336			0.473

F-stat.	14.48	27.38
Pr(F-stat.)	0.000	0.000
DW-stat.	0.784	1.631

I-AR Roots 0.821

*p-value of t-value of coefficient and F-statistic < 0.05, **p-value of t-value of coefficient and F-statistic < 0.01. I-AR- Inverted AR Roots, 26 after adjustments, Convergence achieved after 15 iterations. Estimate are Ordinary Least Squares. σ is the standard error for each estimates, Pr(t) is the p-value for each t-statistic. Coef & Apr (Coefficient and apriori sign).
Source: Authors (2023)

Table 6: Stock market transaction volume model (MVOL_t)

Z _k	Coef & Apr	Est.	σ	Pr(t)	Est.	σ	Pr(t)
		Panel A: Model (without AR)			Panel B: Model (with AR)		
Const.	ϕ_0^+	1.102	13.825	0.937	7.417	22.262	0.072
XVOL _t	ϕ_1^-	0.484	0.553	0.389	-0.020	0.281	0.094
NGDP _t	ϕ_2^+	1.410	0.178	0.000	0.568	0.575	0.000
FFDI _t	ϕ_3^+	0.633	0.350	0.082	0.023	0.204	0.012
BLRT _t	ϕ_4^+	-2.497	0.739	0.002	-0.866	0.556	0.000
GFCF _t	ϕ_5^+	-0.601	0.502	0.242	-0.181	0.591	0.163
AR _{t-2}	-				0.950	0.053	0.000
Statistics							
\bar{R}^2				0.943			0.975
F-stat.				86.70			154.2
Pr(F-stat.)				0.000			0.000
DW-stat.				0.760			1.688

I-AR Roots 0.952

Note: *p-value of t-value of coefficient and F-statistic < 0.05, **p-value of t-value of coefficient and F-statistic < 0.01. I-AR- Inverted AR Roots, 31 after adjustments, Convergence achieved after 17 iterations. Estimate are Ordinary Least Squares. σ is the standard error for each estimates, Pr(t) is the p-value for each t-statistic. Coef & Apr (Coefficient and apriori sign).
Source: Authors (2023)

Table 7: Diagnostic tests

Tests	Returns	Capitalization	Liquidity	Volume
Serial Correlation:				
F-stat.	2.182	1.925	0.502	0.391
Pr(F-stat.)	0.161	0.219	0.595	0.597
Obs*[R²]	5.058	4.621	1.219	1.347
Pr (Obs*[R²])	0.102	0.138	0.481	0.613
Heteroskedasticity:				
F-stat.	0.582	0.580	1.803	1.625
Pr(F-stat.)	0.599	0.722	0.201	0.214
Obs*[R²]	4.059	3.931	9.604	8.034
Pr (Obs*[R²])	0.212	0.562	0.192	0.228

Note: The null for the Breusch-Godfrey Serial Correlation LM (Breusch-Pagan-Godfrey Heteroskedasticity) Test is that the residuals are not autocorrelated (Heteroskedastic).
Source: Authors (2023)

Granger Causality Test

Table 7 reports the direction of the causal relations, according to the pairwise Granger procedure. The outputs identify cases of no causality, unidirectional- and bidirectional-causality. No causality exists between exchange rate volatility and stock returns; exchange rate

volatility and market liquidity; as well as the exchange rate volatility and transaction volume. The naira-dollar exchange rate swing does not Granger (linearly) causes stock returns, and the returns also not causes the naira volatility, contrary to Umoru and Asekome (2013) that find bi-directional causal reaction between exchange rate movement and stock prices. Khan and Ali (2015) also find a bidirectional relationship between the rupee-dollar volatility and stock price in Pakistan. Oyinpreye and Karimo (2015) shows unidirectional run from the price to exchange rate. Olugbenga (2012) who identifies a unidirectional relationship running from exchange rate to stock market performance. No causality is identified from exchange rate volatility to market capitalization, stock market liquidity and transactions volume. Unidirectional causality runs from stock– market liquidity to market returns, stock– market capitalization to market liquidity, and, from market capitalization to exchange rate volatility. The bidirectional causality is found between stock– market capitalization and market returns, stock– transaction volume and market returns, stock– transaction volume and market capitalization, stock– transaction volume and market liquidity. In sum, the tests indicate no linear (Granger) causality between exchange rate volatility and the considered dimensions of stock market development – returns, capitalization, liquidity and volume.

Findings and Implications

The study outcomes, on the impact of naira-dollar rate volatility on stock development, identify mixed evidence. The correlation shows that the currency volatility has significant but weak negative relation with market capitalization and transaction volume. The volatility of exchange rate has a significant negative impact on stock returns, but insignificant negative impacts on stock market capitalization and volume of transactions. In addition, exchange rate volatility has an insignificant positive impact on stock market liquidity. The domestic investment and the banking sector development have significant positive impacts on stock returns. GDP and FDI have significant positive impact on stock capitalization. There is neither unidirectional nor bidirectional causality between volatility and stock market development.

The paper shows the exchange rate volatility has a significant negative influence on stock returns, therefore collaborates Evbariyo-Osagie and Emeni (2015) that reveal significant negative impact of present and previous period values of exchange rate on stock returns in Nigeria, but contradicts other studies (Kennedy & Nourizad, 2016; Najafzadeh, Monjazez & Mamipour, 2016). Kennedy and Nourizad (2016) show significant positive impact of current and lagged values of currency volatility on the US stock returns. Najafzadeh et al. (2016) reveal

a significant positive impact of currency volatility on stock returns in Bangladesh, Indonesia, Iran and Pakistan.

The finding of no causality between exchange rate volatility and stock market return contradicts the finding by Olugbenga (2012), who uncovers a unidirectional causality running from exchange rate to stock returns in Nigeria. The negative impact is to be expected due to more recent high amount of capital importation reliance for production amongst the Nigerian firms. The uncertainties as well as the cost implications of the naira-dollar rate swings would have a reductive impact firm performance, and by extension their market value, thereby, leading to reduction on the returns of firm shares.

The study finds an insignificant negative impact of naira-dollar rate volatility on stock capitalization in Nigeria. This finding is consistent with others in Nigeria (Lawal & Ijirshar, 2015; Sichoongwe, 2016). Lawal and Ijirshar (2015) identify adverse impact of naira-dollar rate on market capitalization. Sichoongwe (2016) shows that exchange rate volatility has a significant adverse impact on stock capitalization. This outcome conflicts finding, by Mlambo et al. (2013), on effect of the rand volatility on stock capitalization in the South African market.

The result is realistic considering the high dollar demand to source materials for production as well as bids to internationalize operations amongst firms. In addition, low global competitiveness of the firms, resulting from the high import dependence, will have a reductive effect on their market values, thereby, lowering the stock capitalization. This is even worse because the present policy mix have not positioned the market to benefit from spillover interactions of global strong currencies.

CONCLUSION

This paper provides evidence on the connection between exchange rate volatility and the stock market in Nigeria. To avoid spurious regression, except for the stock market capitalization, the initial estimations for stock- return, liquidity, and transaction volume are all adjusted with iterated orders of autoregressive schemes, and this correct for autocorrelation as well as improve the results. The paper finds evidence that is in tandem with extant body of literature, and more specifically that exchange rate volatility has weak but significant negative correlation with stock market capitalization and transaction volume. The findings suggest that several policy steps can be implemented to position the capital market to gain from the volatility of the naira-dollar rate, while simultaneously ensuring measures to curb excessive swings overtime.

In sum, policy mix wherein exchange rate management are augmented with import substitution and export promotion, as well as growth-inducing infrastructural investments to make business environment conducive are encouraged. The firms should be provided incentives, such as tax cuts or public partnership, to reduce importation and look inward in sourcing of raw materials. This will reduce pressure on dollar demand and boost the naira. Critical infrastructure to minimize the cost of doing business should be put in place. This will enhance profitability and will affect stock market value and share price, leading to higher stock market returns. The market capitalization can be increase by removing trade impediments to ensure fair trading transactions and transparency. With this, investor confidence can be boosted encouraging domestic stock market investments, reducing the demand for dollar on the part of Nigerians who trade shares abroad as well driving financial deepening. The increased efficiency of the market will attract even more foreign direct- and portfolio- investments, and as such, increase the demand for the naira.

REFERENCES

- Adekunle A. O., Gbadebo A. D. & Akande, J. O. (2022). *International Journal of Economics and Financial Issues*, 2022, 12(4), 106-113. <https://doi.org/10.32479/ijefi.9043>
- Alegwu, F.O., Aye, G.C., Asogwa, B.C. (2017). Asymmetric effect of real exchange rate volatility on agricultural products export: A case study. *International Economics*, 70, 261-279.
- Al-Smadi, A. W., Al-Smadi, R. W., Al-Afeef, M. A., Al-Afeef, M. A. M., & Kalbouneh, N. Y. (2023). Consequences to the stock market caused by currency fluctuations: Jordanian evidence. *International Journal of Professional Business Review*, 8(4), e01275. <https://doi.org/10.26668/businessreview/2023.v8i4.1275>
- Central Bank of Nigeria. (2022). *Monthly average exchange rates of the naira*. Retrieved from <http://www.cbn.gov.ng/rates/exrate.asp>
- Central Bank of Nigeria. (2022). Statistics database. Available from: <https://www.statistics.cbn.gov.ng/cbn-onlinestats/DataBrowser.aspx>
- Cevik, N. K., Dibooglu, S., & Kutan, A. M. (2016). Real and financial sector studies in Central and Eastern Europe: A review. *Czech Journal of Economics and Finance*, 66(1), 2–31
- David, O. O., & Grobler, W. (2020). Information and communication technology penetration level as an impetus for economic growth and development in Africa. *Economic Research-Ekonomska Istra-zivanja*, 33(1), 1394–1418. <https://doi.org/10.1080/1331677x.2020.1745661>
- David, R. O., Dikko, H. G., & Gulumbe, S. U. (2016). Modelling volatility of the exchange rate of the naira to major currencies. *CBN Journal of Applied Statistics*, 7(2), 159-187.

Ehrmann, M., Fratzscher, M., & Rigobon, R. (2011). Stocks, bonds, money markets and exchange rates: Measuring international financial transmission. *Journal of Applied Econometrics*, 26(6), 948–974. <https://doi.org/10.3386=w11166>

El-Wassal, K. A. (2013). The development of stock market: In search of a theory. *International Journal of Economics and Financial Issues*, 3(3), 606-624.

Evbayiro-Osagie, E. I & Emeni, F. K (2015). Inflation rates, financial openness, exchange rates and stock market returns volatility in Nigeria. *ICAN Journal of Accounting & Finance*, 4(1), 125-140.

Gbadebo, A. D. (2023). Does exchange rates swings affect trade? Evidence from an emerging open economy. *International Journal of Economics and Financial Issues*, 13(1), 132-143. <https://doi.org/10.32479/ijefi.13929>

Haryono, S., & Atika, B. (2023). Analyzing the dynamics of Islamic stock market indices in several Muslim countries. *International Journal of Professional Business Review*, 8(7), e02891. <https://doi.org/10.26668/businessreview/2023.v8i7.2891>

Kennedy, K. Nourizaa, F. (2016). Exchange rate volatility and its effect on stock market volatility. *International Journal of Human Capital in Urban Management*, 1(1), 37-46.

Khan, R. E. A & Ali, R. (2015). Causality analysis of volatility in exchange rate and stock market prices: a case study of Pakistan. *Asian Economic and Financial Review*, 5(5), 805-815.

Khosa, J., Botha, I., & Pretorius, M. (2015). The impact of exchange rate volatility on emerging market exports. *Acta Commercii*, 15(1), 1-11.

Lawal, M. & Ijirshar, V. U. (2015). Empirical analysis of exchange rate volatility and Nigeria stock market performance. *International Journal of Science and Research*, 4(4), 1592-1600.

Mlambo, C., Maredza, A., & Sibanda, K. (2013). Effects of exchange rate volatility on the stock market: A case study of South Africa. *Mediterranean Journal of Social Sciences*, 4(14), 561-570.

Najafzadeh, B., Monjazebeh, M. & Mamipour, S. (2016). The analysis of real exchange rate volatility and stock return with PANEL-GARCH approach. *Iranian Economic Review*, 20(4), 525-550.

Nigerian Stock Exchange. (2021). *Market indices - All share index*. Retrieved from <http://www.nse.com.ng/products/indices>

Nkoro, E., & Uko, A. K. (2016). Exchange rate and inflation volatility and stock prices volatility: Evidence from Nigeria, 1986-2012. *Journal of Applied Finance & Banking*, 6(6), 57-70.

Olugbenga, A. A, (2015). Exchange rate volatility and stock market behaviour: the Nigerian experience. *Research Journal of Finance and Accounting*, 3(3), 88-96

Oyinpreye, A. T. & Karimo, T. M. (2015). The effect of exchange rate volatility on share price fluctuations in Nigeria. Paper presented at 28th the IIER International Conference, Paris, France.

Sichoongwe, K. (2016). Effects of real exchange rate volatility on the stock market: The Zambian experience. *Journal of Economics and Sustainable Development*, 7(4), 114-119.

Sikhosana, A., & Aye, G. C. (2018). Asymmetric volatility transmission between the real exchange rate and stock returns in South Africa. *Economic Analysis and Policy*, 60, 1–8. <https://doi.org/10.1016/j.eap.2018.08.002>

Subair, K., & Salihu, O. M. (2010, September). Exchange rate volatility and the stock market: The Nigerian experience. Paper presented at the Academic and Business Research Institute International Conference, Orlando.

Tule, M., Dogo, M., & Uzonwanne, G. (2018). Volatility of stock market returns and the naira exchange rate. *Global Finance Journal*, 35, 97–105. <https://doi.org/10.1016/j.gfj.2017.08.001>

Umoru, D., & Asekome, M. O. (2013). Stock prices and exchange rate variability in Nigeria econometric analysis of the evidence. *European Scientific Journal*, 9(25), 261-285.

Vo, X. V., & Tran, T. A. (2020). Modelling volatility spillovers from the US equity market to ASEAN stock markets. *Pacific-Basin Finance Journal*, 59, 101246. <https://doi.org/10.1016/j.pacfin.2019.101246>

World Bank (2021). Nigeria: World Bank Development Indicators. Washington DC: World Bank

Yang, S. Y., & Doong, S. C. (2004). Price and volatility spillovers between stock prices and exchange rates: Empirical evidence from the G-7 countries. *International Journal of Business and Economics*, 3, 139–153.

Yip, P. S., Brooks, R., Do, H. X., & Nguyen, D. K. (2020). Dynamic volatility spillover effects between oil and agricultural products. *International Review of Financial Analysis*, 69, 101465. <https://doi.org/10.1016/j.irfa.2020.101465>