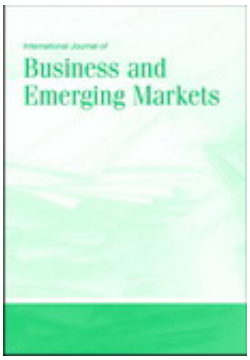

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Do foreign risks affect the stock market in an emerging economy? A time-series analysis

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Do foreign risks affect the stock market in an emerging economy? A time-series analysis

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Abstract: The recent global uncertainty had influenced the choices of investors. As a result, investors may defer purchases and investments in the stock market owing to a wait-and-see policy in the face of global uncertainty. In this context, this study's main objective is to explore the link between global uncertainty and the stock market in Nigeria, utilising quarterly data ranging from January 2010 and December 2018. The study deployed ARDL and Toda-Yamamoto causality test to examine this interconnection. The finding from the ARDL bounds test revealed evidence of cointegration between the stock market index and its determinants in the long run. It further shows that the stock market is negatively affected by global risk, while it is evident that economic growth positively impacts the stock market in Nigeria. However, the exchange rate impacts on the stock market tend to be insignificant in the long run.

Keywords: global risk; stock market; ARDL; emerging economy.

JEL codes: G1, C58, C32.

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1 Introduction

The vital role of the financial market towards economic development has been overemphasised in previous literature (Adebayo et al., 2020). The process of economic development is built on a well-structured financial system. These reasons have caused several researchers (Levine and Zervos, 1998; Demirgüç-Kunt and Levine, 1996; Singh, 1997; Atje and Jovanovic, 1993) to extensively examine the significant role been played by the stock market development on economic development. Several countries (including developed and emerging countries) had experienced significant stock market development, which can be traced to the change in the influx of capital inflow, which is caused by the acceleration of the globalised investment. Rapid liberalisation of capital flows had been responsible for the trend in the globalisation trend, which will continue to increase in the future.

The world is being increasingly complicated, unstable, and certainly unpredictable. John Maynard Keynes's book – *The General Theory of Employment, Interest, and Money* addressed uncertainty as a critical aspect. It provides an understanding that both investors and consumers hesitate to either spend or invest when they perceive economic uncertainty. However, several kinds of literature were able to disclose that some major macroeconomics indicators such as economic growth, investment, and inflation tend to be negatively affected by economic policy uncertainty (Friedman, 1968; Bernanke, 1983; Dixit, 1989; Bachmann et al., 2013; Bloom, 2009; Rodrik, 1989; Jones and Eric, 2013). However, there is a crucial link since economic policy uncertainty will have significant effects on the macroeconomic fundamentals, then its effects on stock market performance will also be anticipated. Baker et al. (2016) set up a degree of economic policy uncertainty and considers it to affect business activity. Since most of the decisions of many investors are being made under uncertainty in finance, Ozoguz (2009) indicates that change in information over time tends to influence a change in perceptions with a resultant effect on the values of assets. Bekaert et al. (2013) reveal that term structure is being influenced by uncertainty, which is the primary reason for the countercyclical volatility of asset returns.

Due to globalisation, a major shock in political, social, and economic activities tend to affect the world, primarily when such shock occurs in a developed economy. Greece defaulted on her debt in the Eurozone debt crisis that started in 2009. It escalated to a situation where Spain, Portugal, Ireland, and Italy became potential parties to debt defaults, which became a significant threat to the world in 2011 and 2012. Another uncertainty in a developed economy that causes a great shock was the global financial crisis. This crisis opens a significant consequence, which has a significant impact on the global economy. It caused a broad range of malfunction in the financial markets, causing the credit and liquidity crises, which led to the downfall of several large financial institutions such as Lehman Brothers, resulting in an international banking crisis. This crisis also engines the loss of confidence in the banking sector, and the collapse of the banks harms the economy as a whole. The severe effect of it has been transferred to the main sectors of the economy, which resulted in job loss. However, several financial and economic literature (Ehrmann and Fratzscher, 2009; Chinn and Frankel, 2004; Kirikkaleli, 2020; Forbes and Chinn, 2004) argue that when a country experiences an economic or financial shock, the effect can be direct or indirect on the global economies.

Nevertheless, researchers have given relatively little attention to the issue of what has been the impact of foreign risk towards stock market development, especially in emerging markets. It has been observed that foreign risk plays a significant role in affecting the stock market by intensifying the stock market investment risk. During the financial crisis in 2008, the emerging stock market also suffered from this crisis, and the capital market tends to be highly sensitive to react to such a global event – for example, the Nigerian stock market experiences tremendous growth from 2004 to the second quarter of 2008. However, the stock market experienced a considerable downturn in the third quarter of 2008, when the crisis was announced. Several investors withdraw their resources, causing a significant drop in the stock market index. During this crisis, the stock market lost about $US13.9 billion in market capitalisation and about 54% in the all-share index, after reaching 74.9% in return. The vulnerability of global risk clearly could lead to the stock market collapse or bubbles (Kirikkaleli, 2020). The stock market has recovered from the loss in confidence created during this event through a well-structured policy.

Global uncertainty has experienced a surge in recent times. Several global uncertainties that has happen during last decade are as follows: Sovereign debt crisis in Europe, political risk in Greece and Ukraine, USA-China trade tensions, US presidential elections, Brexit, and political tensions, Ukraine-Russia war, COVID-19, etc. However, investors, policymakers, businesses, and academic researchers need to know the impact of these recent global uncertainties on the emerging stock market since the global economy is now more closely linked. Since studies focusing on the emerging stock markets are limited, this main objective of this study is to build a model that examines the effect of global uncertainty on Nigeria's stock market, which serves as the main novelty of this study. This research is needed because, in the current literature, no previous study explores this phenomenon. This research tends to fill in the gap in the previous literature. Another contribution of this study entails incorporating economic growth and exchange rate as the control variable. This study will follow this structure: Section 2 of this study will provide an overview into previous literature interrelated to the topic at hand; the data and also the methodology employed in this study will be presented in Section 3; Section 4 provides details on the empirical finding of our study; and finally, the concluding part of this study is detailed in Section 5.

2 Literature review

Numerous studies have scrutinised the nexus between the stock market and economic growth, but can be traced to Schumpeter's finance-led growth hypothesis – showing how finance improves growth through the channelling of resources to the deficits units from the surplus units (Cave et al., 2019; Pradhan et al., 2019, 2020; Levine and Zervos, 1996, 1998; Arestis et al., 2001; Singh, 1997; Bencivenga et al., 1996; Atje and Javanovic, 1993). However, different literature (Goldsmith, 1969; King and Levine, 1993) provided support for this hypothesis. A different perspective was introduced by some scholars (Jung, 1986; Fritz, 1984; Gurley and Shaw, 1967; Ireland, 1994), indicating a growth-led finance hypothesis. The primary concentration of these studies was mainly bank-based financial indicators instead of the stock market. However, since the financial market has

increased, the major focus is being centred on the stock market indicators. The stock market promotes growth and development through the increased demand generated from the actualisation of long term investment projects. Levine and Zervos (1996) opined that a critical indicator of long-run GDP growth is the development of the stock market. Naik and Padhi (2015) concluded that the number of investment prospects increases in an economy when there is a well-structured stock market.

Many studies investigated the effects of domestics uncertainty on the country's stock market returns (Bekiros et al., 2015, 2016; Brogaard and Detzel, 2015; Jurado et al., 2015; Kang and Ratti, 2013); Redl, 2015; Hammoudeh and McAleer, 2015; Arouri et al., 2016; Antonakakis et al., 2013). However, there are limited studies that have examined the impact of global uncertainty on the stock market (Sum, 2012a, 2013b; Chuliá et al., 2017; Balcilar et al., 2015; Mensi et al., 2014; Momin and Masih, 2015). Ozoguz (2009) establishes a negative connection between stock market return and economic policy uncertainty using the Markov regime-switching. Besides, Dzielinski (2012) concluded that as the level of economic policy uncertainty increase, stock market returns also drop significantly. Sum (2012a) establishes that economic uncertainty has a negative impact on the stock market return in Croatia, Ukraine, Russia, Norway, Turkey, Switzerland, and the Eurozone. Sum (2012b, 2013a) shows that the effects of economic policy uncertainty in the USA have a negative spillover on the Association of Southeast Asian Nations (ASEAN), Russia, India, and Brazil. The interconnection between global uncertainty and the stock market index was explored by Ko and Lee (2015) utilising wavelet coherence techniques. Results reveal that the stock market index has a negative connection with global policy uncertainty. Das and Kumar (2018) also extended the contribution of Ko and Lee (2015) by using multiple and partial wavelet coherence techniques. They reveal that the stock market in emerging economies is less exposed to international shocks. Kirikkaleli (2020) investigated the influence of global risk on Taiwan's stock market. He also reveals that foreign risk affects stock price negatively. Currently, there are few works concentrated on the stock market in Nigeria. Thus, this study examines the effect of global uncertainty on the stock market in Nigeria. Furthermore, the hypotheses guarding this study are:

H0 Global uncertainity does not have any significant effect on stock market in Nigeria.

H1 Global uncertainity do have significant effect on stock market in Nigeria.

3 Data and methods

In this empirical analysis, the variables deployed in this study comprise quarterly data between 2010 and 2018; the stock market index was obtained from the Nigeria bureau of statistics (https://www.nigerianstat.gov.ng/). The global risk index was gathered from the economic policy uncertainty index (https://www.policyuncertainty.com/). Also, the GDP growth was obtained from the World Bank database (https://databank.worldbank.org/home.aspx) while the exchange rate was obtained from the central bank of Nigeria database (https://www.cbn.gov.ng/rates/). Table 1 portrays the description of the variables utilised.

Table 1 Variables description

	STM	*GRT*	*GDP*	*EXR*
Mean	1,374.194	143.2637	2,432.959	249.1645
Median	1,308.787	141.4410	2,412.367	213.5722
Maximum	1,951.783	236.9580	2,563.900	372.5474
Minimum	906.1433	94.57422	2,292.445	186.4274
Std. dev.	318.0409	35.31790	87.64200	65.97436
Skewness	0.256840	0.843185	0.179422	0.900748
Kurtosis	1.716701	3.218620	2.050161	1.982757
Jarque-Bera	2.866087	4.337459	1.546446	6.420257
Probability	0.238582	0.114323	0.461523	0.040351
Observations	36	36	36	36

Source: Investigator compilation

The study data description is depicted in Table 1. It is clear that the STM, GRT, GDP, and EXR range between 906 and 1951, from 94 to 236, between 2,292 and 2,563, and from 186 to 372, respectively. The distribution of the variables utilised is also depicted in Table 1. Besides, the information in regards to kurtosis, Jarque-Bera, and skewness is depicted in Table 1.

In exploring the impact of global economic policy uncertainty index, GDP growth, and exchange rate on Nigeria's stock market index, the following economic function, economic mode, and econometric model were formulated in equations (1), (2), and (3), respectively.

Equation (1) demonstrates the economic function

$$SMT = f(GRK, GDP, EXR) \tag{1}$$

Equations (2) and (3) depict the economic model and the econometric model correspondingly:

$$SMT_t = \vartheta_0 + \vartheta_1 GRK_t + \vartheta_2 GDP_t + \vartheta_3 EXR_t \tag{2}$$

$$SMT_t = \vartheta_0 + \vartheta_1 GRK_t + \vartheta_2 GDP_t + \vartheta_3 EXR_t + \varepsilon_t \tag{3}$$

In equations (1), (2), and (3) above, the stock market index is depicted by SMT_t, and GRT_t represents the global risk, EXR_t portrays the exchange rate, lastly, the GDP growth represented by *GDP*. The natural logarithm of the variable deployed was taken. This is done to reduce skewness. This research is premised on the framework constructed by Kirikkaleli (2020), which explores the influence of domestic and international uncertainty on Taiwan's stock market index utilising quarterly data between 1997 and 2015. Several researchers have pinpointed the essential role of global risk in their research on developing markets (Ko and Lee, 2015; Das and Kumar; 2018; Kirikkaleli, 2020). Before commencing the analysis, the order of integration of SMT, GRK, GDP and EXR was initially examined by deploying the conventional unit root tests (ADF, PP, DF-GLS, and KPSS) initiated by Dickey and Fuller (1981), Phillips and Perron (1988), Elliot et al. (1996) and Kwiatkowski et al. (1992) respectively. Furthermore, structural break(s) are

taken into consideration by deploying more recent unit root tests (ZA and LM) initiated by Zivot and Andrews (2002) and Lee and Strazicich (2003), respectively.

3.1 ARDL approaches

The long-run connection was determined using the ARDL bound test, which is the innovation of Pesaran et al. (2001), which is premised on equation (3) after the order of integration was ascertained among the variables used. However, there are several cointegration techniques, but this study deployed the ARDL bound test because it has more advantage compared to the other cointegration techniques such as:

1 the bound test is flexible and allowed variable integrated at the order I(0) and 1(1) to be utilised in the model

2 unbiased long-term estimate

3 applying the ARDL bound test, the small sample sizes could be evaluated more accurately than with conventional cointegration tests

4 the issue of endogeneity is avoided.

The cointegration test was tested using the F-statistic devised by Pesaran et al. (2001). Cointegration does not exist in the long term, and cointegration does exist in the long term are the null and alternative hypotheses for this test, respectively. The alternative hypothesis is accepted if the F-Stat is higher than the lower and upper bound critical value at 1%, 5%, and 10%, respectively, depicting cointegration amongst the variables.

Equation (4) shows the representation of the ARDL model in this study.

$$\begin{aligned}\Delta SMT_t = {} & \theta_0 + \sum_{l=1}^{p} \theta_1 \Delta SMT_{t-1} + \sum_{l=1}^{p} \theta_2 \Delta GRK_{t-1} + \sum_{l=1}^{p} \theta_3 \Delta GDP_{t-1} \\ & + \sum_{l=1}^{p} \theta_4 \Delta EXR_{t-1} + \pi_1 SMT_{t-1} + \pi_2 GRK_{t-1} + \pi_3 GDP_{t-1} \\ & + \pi_4 EXR_{t-1} + \in_t \end{aligned} \tag{4}$$

In equation (4), the variable's coefficients of the short-run dynamic are represented by θ_i ($i = 1 \ldots 4$), the long-run connection amongst variables is shown by π_i ($i = 1 \ldots 4$), lag lengths are illustrated by t. Integrating the ECM into the ARDL short-term parameter, which transforms equation (4) into equation (5):

$$\begin{aligned}\Delta SMT_t = {} & \theta_0 + \sum_{l=1}^{p} \theta_1 \Delta SMT_{t-1} + \sum_{l=1}^{p} \theta_2 \Delta GRK_{t-1} + \sum_{l=1}^{p} \theta_3 \Delta GDP_{t-1} \\ & + \sum_{l=1}^{p} \theta_4 \Delta EXR_{t-1} + \varphi ECT_{t-i} + \varepsilon_t \end{aligned} \tag{5}$$

where the speed of adjustment of short-run to attain equilibrium in the long-term is represented by φ and the error correction term is indicated by ECT_t. The predictable symbol of this coefficient, as anticipated, is negative and significant. After identifying the cointegration association in equation (4) the ARDL method was utilised to analyse the dynamic interaction between the stock market index and its determinants. Also, the Toda

Yamamoto causality technique and variance decomposition were performed to investigate the impact of global economic policy uncertainty index, GDP growth, and exchange rate on Nigeria's Stock Market index.

3.2 Granger causality approach

The long-run presence of cointegration among these measures demonstrates the existence of causal interaction (either one-way or feedback). Since the ARDL approach reveals the interconnection between factors, the path of causality between variables is not ascertained. There is no difficult in executing the Granger Causality test and it is applicable to a variety of empirical research. However, the conventional Granger causality possesses many drawbacks, which are: firstly, without accounting for the effects of additional variables, a two-variable Granger-Causality test is susceptible to specification bias. According to Gujarati (1995, 1978), a causality test is vulnerable to model specification and lag number. If it were important and not included in the model, different results would appear. The empirical evidence of a two-series Granger causality is therefore vulnerable due of this difficulty. Second, time series data are frequently non-stationary. This circumstance may exemplify the problem of spurious regression. Other flaws in these tests were addressed by Toda and Phillips (1994). Toda and Yamamoto (1995) provide an insightful suggestion. Nevertheless, the new approach involves calculating an expanded VAR that guarantees asymptotic distribution of the Wald statistics, since the test method is robust to the properties of device cointegration and integration. This research thus implemented the Toda Yamamoto causality test to catch the causality direction between used variables. Equation (6) below shows the causality test.

$$Y_t = \delta_o + \sum_{i=1}^{m} \vartheta_i Y_{t-1} + \sum_{i=m+1}^{m+d\max} \vartheta_i Y_{t-1} + \sum_{i=1}^{m} \beta_1 X_{t-1} + \sum_{i=m+1}^{m+d\max} \beta_1 X_{t-1} + \mu_t \tag{6}$$

$$X_t = \omega_o + \sum_{i=1}^{m} \alpha_i X_{t-1} + \sum_{i=m+1}^{m+d\max} X_i Y_{t-1} + \sum_{i=1}^{m} \pi_1 Y_{t-1} + \sum_{i=m+1}^{m+d\max} \pi_1 Y_{t-1} + \mu_t \tag{7}$$

X and *Y* are parameters in the equations (7) and (8), the lag length is explained by *t*, while the error term denoted by μ_t and ε_t.

3.3 Variance decomposition

Variances decomposition implies the contribution of each other to autoregression. It determines the degree of variation in forecast error for each parameter, which can be introduced to the other indicators by exogenous shocks. The decomposition of variances is used to define the VAR structure until they are measured, and the cumulative

information that each parameter contributes to the other parameter is typically indicated in the VAR model. Below VAR (p) is defined as:

$$Y_t = v + A_1 y_{t-1} + \ldots A_p y_{t-p} + \epsilon_t \tag{8}$$

By drafting it in equation (10), this can be transformed into a VAR (1) structure

$$y_t = AY_{t-1} + \ldots \varepsilon_t \tag{9}$$

where A represented the below matrix equation

$$A = \begin{bmatrix} A_1 & A_2 & \ldots & A_{p-1} & A_p \\ I_k & 0 & \ldots & 0 & 0 \\ 0 & I_k & & 0 & 0 \\ \vdots & & \ddots & \vdots & \vdots \\ 0 & 0 & \ldots & I_k & 0 \end{bmatrix} Y = \begin{bmatrix} y_1 \\ \vdots \\ y_p \end{bmatrix} V = \begin{bmatrix} v \\ 0 \\ \vdots \\ 0 \end{bmatrix} \text{and} \begin{bmatrix} u_t \\ 0 \\ \vdots \\ 0 \end{bmatrix} \tag{10}$$

where y_t, v and μ are the dimensional vectors column, A is dimensional matrix. The mean square error of h-step forecast of variable j;

$$MSE = \left[y_{j,t}(h) \right] = \sum_{i=0}^{h-1} \sum_{k-1}^{k} \left(e_j \Theta_i e_k \right)^2 = \left(\sum_{i=1}^{h-1} \Theta_i \Theta_1^1 \right) jj = \left(\sum_{i=0}^{h-1} \phi_i \Sigma_u \phi_i^{/} \right) jj \tag{11}$$

wherein e_j, is the j^{th}, the column of the I_k, and subscript jj states the component of the matrix, $\Theta_i = \Phi_i p_i$, where p is a lower triangle matrix found by Cholesky decomposition of Σ_u such that $\Sigma_u = pp^t$, where Σ_u is the covariance matrix of the error μt, $\phi_i = JA^i J^i$, where $I = [I_k, 0 \ldots 0]$, so that I is a k by kp dimensional matrix.

$$\omega_{jk,h} = \sum_{i=0}^{h-1} \left(e_j^i \Theta_i e_k \right) 2_{/} MSE \left[y_{j,t}(h) \right] \tag{12}$$

The extent of forecast error variance of variable j accounted for by exogenous shocks to variable k is portrayed by $\omega_{jk,h}$.

4 Results

4.1 Unit root results

The order of integration is firstly examined before exploring the influence of global risk (GRK), GDP growth (GDP), and exchange rate (EXR) on the stock market. The conventional unit root tests (ADF, PP, and DF-GLS), which cannot detect structural break(s) was initially employed. Furthermore, after putting the influence of structural break(s) into consideration, the ZA and LS unit root tests were employed to capture one and two structural break(s) correspondingly. The result of these tests is portrayed in Tables 2 and 3 separately. The outcome of the unit root tests demonstrates that all the variables deployed are integrated in mixed order, i.e., I(0) and I(1). These outcomes permit the bounds test to be implemented to ascertain if there is evidence of a cointegration connection among the variables utilised.

Table 2 Traditional unit root tests

Tests	*STM*	*Order*	*GDP*	*Order*	*GRK*	*Order*	*EXR*	*Order*
$ADF_{C\&T}$	–4.035**	I(1)	–6.244*	I(1)	–5.819*	I(1)	–4.585*	I(1)
$PPC_{C\&T}$	–4.035*	I(1)	–6.251*	I(1)	–5.835*	I(1)	–4.115**	I(1)
$DFGLS_{C\&T}$	–4.123*	I(1)	–6.305*	I(1)	–5.885*	I(1)	–4.695*	I(1)
$KPSS_{C\&T}$	0.127***	I(0)	0.556*	I(0)	0.131***	I(0)	0.176**	I(0)

Note: *, **, *** symbolise the level of significance for 1%, 5% and 10% correspondingly. C&T portrays constant and trend.

Source: Author compilation

Table 3 Structural break unit root tests

Tests	*STM*	*Order*	*Y*	*Order*	*GRK*	*Order*	*EXR*	*Order*
$ZA_{C\&T}$	–5.167*	I(1)	–4.146*	I(1)	–7.717*	I(1)	–10.142*	I(1)
	[2017Q2]		[2014]		[2003]		[2016Q1]	
$LS_{C\&T}$	–10.465***	I(1)	–11.449*	I(1)	–8.203*	I(1)	-6.694*	I(1)
	[2014Q1]		[2013Q4]		[2014Q4]		[2015Q1]	
	{2017Q2}		{2015Q4}		{2016Q3}		{2016Q4}	

Note: *, **, *** denote the level of significance for 1%, 5% and 10% respectively.

Source: Author compilation

4.2 Cointegration findings

The ARDL Bounds test method created by Pesaran et al. (2001) was deployed to analyse the variables' long-run cointegration. Table 4 illustrates the cointegration result premised on equation (3). The F-statistic (7.50) is significant at the level of 1%. This finding illustrates that the null hypothesis is rejected. Thus, there is evidence of cointegration between the stock market index, and its determinants in the long run. The implication of this result paves the way for the estimation of the ARDL estimator in the long and short run.

Table 4 ARDL approach to cointegration

Model specification	$SMT = f(GRK, GDP, EXR)$
F-statistic	7.50*
Lower and upper bound	4.29 and 5.61
Inference	(5, 5, 5, 4)
Cointegration	Yes

Source: Author compilation

4.3 ARDL long-run estimate

Table 5 illustrates the coefficients of long-run interaction and ECM. Using the Akaike criterion (AIC), a maximum of 5 lags was used to explore the long-run spillover between the stock market index and its determinants in Nigeria. The ARDL (5, 5, 5, 4) is the best fit for the model. Findings from Table 4 demonstrate

1 Global risk has an adverse effect on the stock market index. This means that at a 5% level of significance when other factors are held constant 1% increase in global risk will reduce the stock market index by 2.44%. This finding is justified since it demonstrates the significance of external economic policy shocks for STM in Nigeria. Investors are also well-known to be very susceptible to external risks and vulnerabilities.

2 GDP growth positively impacts the stock market index. This illustrates that a 3.12% increase in the stock market index is a result of a 1% increase in GDP growth

3 An insignificant link was found between the stock market and the exchange rate.

This outcome agrees with past studies. As anticipated, the sign of the ECM is statistically significant and negative. The estimated ECM is –0.670, signifying that nearly 60% of previous quarters disequilibrium from the 'shock is eradicated in the present quarter.

Furthermore, the following diagnostic tests were conducted on the study's model and were presented in Table 5, which indicates that the model is a BLUE. The CUSUM and CUSUM sq. results display that the model is stable at a 5% level of significance.

Table 5 ARDL estimation

Dependent variable: STM			
Regressors	*Coefficient*	*T-statistic*	*Probability*
	–2.448	–2.398	0.043**
	3.125	2.891	0.020**
	2.567	1.426	0.191
Error correction coefficient			
	Coefficient	*T-statistic*	*Probability*
ECM(–1)	–0.670	–6.426	0.000*
Diagnostic check			
χ^2 Normality	2.01(0.36)		
χ^2 LM	1.51(0.29)		
χ^2 Heteroscedasticity	1.72(0.21)		
χ^2 Ramsey	0.85(0.41)		
Stability check			
CUSUM test	Stable at 5% level		
CUSUM sq. test	Stable at 5% level		
R^2	0.98		
Adj. R^2	0.97		
F-statistic	34.89		
Prob (F-Stat)	0.000		

Note: *, **, signifies significance level of 1% and 5% respectively.

Source: Author compilation

4.4 Causality test result

To explore the path of causality between the stock market index (STM) and its determinants [global risk (GRK), GDP growth (GDP), and exchange rate (EXR] in Nigeria, the Toda-Yamamoto causality test were utilised. Finding based on this test is portrayed in Table 6, which depicts:

1 Unidirectional causality running from GRK to STM. This signifies that variation in GRK significantly leads to changes in the stock market index. However, STM cannot predict changes in GRK. This result is as expected

2 Unidirectional causality was found from GDP to STM. This shows that GDP significantly causes STM at a 1% level of significance

3 One-way causality was found running from STM to EXR.

This illustrates that at a 1% significant level, changes in the stock market index will result in changes in the exchange rate in Nigeria.

Table 6 Toda Yamamoto causality tests

	Causality direction	*Lag*	*MWALT*	*Prob.*	*Decision*
Toda Yamamoto Causality	STM → GRK	9	2.6999	0.2592	Do not reject H0
	GRK → STM	9	25.199	0.0028*	Reject H0
	STM → GDP	9	5.6274	0.7765	Do not reject H0
	GDP → STM	9	15.060	0.0893*	Reject H0
	STM → EXR	7	26.257	0.0005*	Reject H0
	EXR → STM	7	5.3086	0.6224	Do not reject H0

Notes: → portrays the path of causality. AIC is utilised in choosing optimal lag.
*signifies statistically significant at 1%.

Source: Authors compilation

Figure 1 CUSUM (see online version for colours)

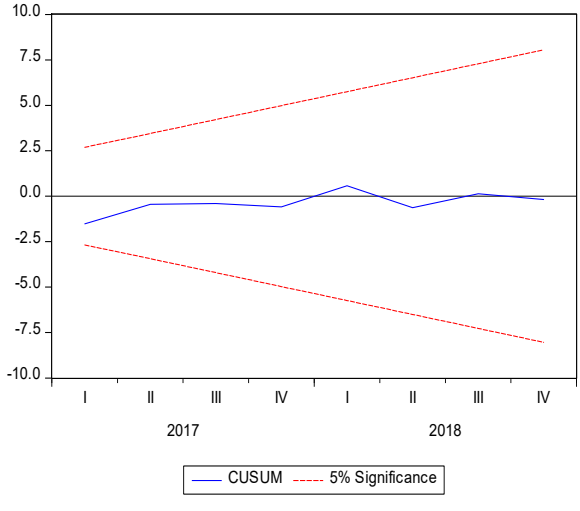
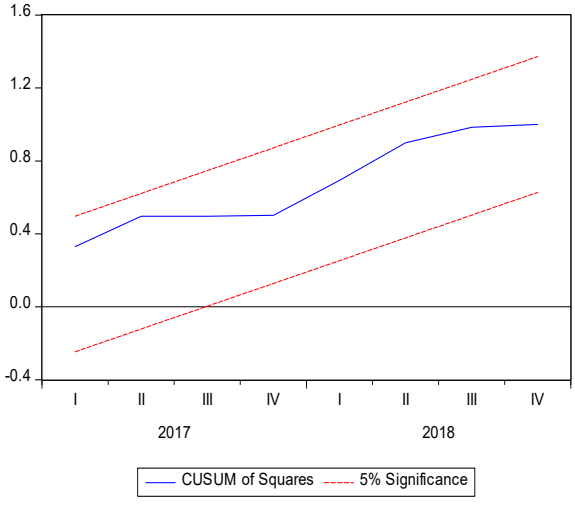


Figure 2 CUSUM sq. (see online version for colours)



4.5 Variance decomposition result

Variance decomposition is used to evaluate the rate in one variable, which is clarified in its own right by a shock of a predicted 12-quarter (three-year-old) error duration gap. The decomposition of the variance reveals how much of a variable change the shock causes, and how much of a variation shocks affect other measures. Table 7 shows that the variance decomposition result of stock market index innovation occurring in the 1-quarter reflects a 100% difference in stock market index volatility (own shock) and has since declined to 63.3% for the different forecast horizons with GDP growth, global risk, and the exchange rate of 5.91%, 26.54%, and 4.20% correspondingly in the 12-quarters (three-year) forecast horizon. This infers that these parameters can add to a specific change in the stock market index. Concerning GDP growth, it contributes 95% to itself in the 1-quarter.

Table 7 Variance decomposition

Period	*S.E.*	*STM*	*GDP*	*GRK*	*EXR*
		Variance decomposition for stock market index			
1	138.4918	100.0000	0.000000	0.000000	0.000000
2	213.5151	97.03162	1.627290	0.817529	0.523559
3	261.5336	87.04382	4.362507	8.223272	0.370397
4	292.4406	77.64724	5.177015	16.73762	0.438129
5	310.3621	71.88288	5.165542	22.45508	0.496501
6	320.0496	68.81253	5.190646	25.52982	0.467004
7	325.1635	67.21259	5.340471	26.87470	0.572233
8	328.1031	66.23825	5.532442	27.30300	0.926313
9	330.2141	65.45564	5.705410	27.30752	1.531425

Source: Authors compilation

Table 7 Variance decomposition (continued)

Period	*S.E.*	*STM*	*GDP*	*GRK*	*EXR*
Variance decomposition for stock market index					
10	332.0916	64.72103	5.831190	27.11963	2.328148
11	333.9495	64.01056	5.900360	26.84699	3.242086
12	335.8421	63.32634	5.919503	26.54677	4.207381
Variance decomposition for GDP per capita					
1	26.29414	4.313027	95.68697	0.000000	0.000000
2	33.37885	12.24644	72.29669	14.52932	0.927543
3	40.34818	20.86230	51.51007	26.55232	1.075307
4	47.67830	26.63643	39.25626	31.24433	2.862978
5	54.86836	29.74460	31.00384	34.83186	4.419699
6	61.52358	31.35398	25.13241	37.71963	5.793975
7	67.32541	32.24984	21.18273	39.52234	7.045083
8	72.14960	32.77798	18.52361	40.66057	8.037849
9	76.02543	33.08120	16.70020	41.44935	8.769251
10	79.02857	33.24582	15.45526	42.00070	9.298220
11	81.26182	33.32672	14.62224	42.38604	9.665000
12	82.85050	33.35632	14.08369	42.65980	9.900194
Variance decomposition for global risk					
1	24.54148	25.96344	3.558208	70.47835	0.000000
2	28.13919	36.14558	3.096176	60.75023	0.008020
3	29.89753	38.79585	3.001734	55.65693	2.545484
4	32.20209	36.28920	2.627719	52.41695	8.666128
5	34.23501	33.85792	2.689784	49.91856	13.53374
6	35.75523	32.53396	2.613518	48.24326	16.60926
7	36.89747	31.89053	2.474780	46.86856	18.76613
8	37.75877	31.52939	2.363515	45.74076	20.36633
9	38.39386	31.25088	2.290963	44.90143	21.55673
10	38.84437	30.99813	2.256830	44.29620	22.44884
11	39.14529	30.77727	2.252437	43.86021	23.11009
12	39.33239	30.59989	2.268592	43.55175	23.57977
Variance decomposition for exchange rate					
1	14.32562	1.768569	5.190370	0.846662	92.19440
2	24.98064	0.614520	23.17367	0.340417	75.87139
3	31.07012	1.095209	23.76561	0.986788	74.15239
4	35.96803	3.127265	20.30476	1.861229	74.70674
5	40.62161	5.545984	17.13543	2.543338	74.77524
6	44.82284	7.491221	14.64260	3.340635	74.52555

Source: Authors compilation

Table 7 Variance decomposition (continued)

Period	*S.E.*	*STM*	*GDP*	*GRK*	*EXR*
		Variance decomposition for exchange rate			
7	48.48241	8.794809	12.71356	4.187076	74.30455
8	51.55267	9.572812	11.30190	4.848489	74.27680
9	54.00247	9.985923	10.30950	5.256993	74.44758
10	55.86993	10.15519	9.632098	5.449447	74.76327
11	57.23954	10.16395	9.188102	5.483291	75.16466
12	58.20945	10.07580	8.913849	5.421556	75.58880

Source: Authors compilation

Nonetheless, in the 12-quarter (3-year), it contributes 14% to itself while the stock market index, global risk, and exchange rate contribute 33.35%, 42.65%, and 9.90%, respectively. The global risk contributes 70% to itself in the first quarter, but in the 12-quarter (three-years), it can only account for 43% of variation by itself with the stock market and GDP growth contributing a significant portion. Lastly, in regards to the exchange rate, it contributes 92% to itself in the 1-quarter. Nevertheless, in the 12-quarter (three-year), it contributes 72% to itself, whereas the stock market index and GDP growth contribute 10% and 8.9%, respectively.

4.6 Discussion

According to Adebayo et al. (2020), the financial market's vital role in economic development has been overemphasised in previous literature. Several authors have investigated the determinants of the stock market in emerging and developed markets (Ehrmann and Fratzscher, 2009; Chinn and Frankel, 2004; Kirikkaleli, 2020; Forbes and Chinn, 2004; Balcilar et al., 2015; Mensi et al., 2014), however, their results are varying and inconclusive. Based on this, this study tends to re-examine the interaction between the stock market and globalisation risk in an emerging market. This study differs from previous studies because it includes the effect of globalisation risk on the stock market, which has not yet been included in regards to developing markets by previous studies. The result of the unit root tests indicates that the series deployed are integrated at a mixed level I(0) and I(1). The Bounds test cointegration revealed evidence of cointegration between the stock market and its determining factors in the long run. Furthermore, the ARDL long-run estimations were carried out, and findings revealed

1 Global risk has an adverse effect on the stock market index. This finding is justified since it demonstrates the significance of external economic policy shocks for the stock market in Nigeria. Investors are also well-known to be very susceptible to external risks and vulnerabilities. This outcome aligns with the fining of Ko and Lee (2015) and Kirikkaleli (2020).

2 GDP growth impact the stock market index positively. This outcome corresponds to past research (Kirikkaleli, 2020; Pradhan et al., 2020).

3 An insignificant link was found between the stock market and the exchange rate.

This outcome does not agree with past studies (Mensi et al., 2014; Momin and Masih, 2015; Kirikkaleli, 2020; Pradhan et al., 2020). As anticipated, the sign of the ECM is statistically significant and negative. The estimated ECM is –0.670, signifying that nearly 60% of previous quarters disequilibrium from the 'shock is eradicated in the present quarter. Also, each model underwent the diagnostic tests, and it is obvious from Table 7 that these diagnostic measures scale up the model. The CUSUM and CUSUMsq results display that the model is stable at a 5% level of significance. To explore the path of causality between the stock market index (STM) and its determinants (global risk (GRK), GDP growth (GDP), and exchange rate (EXR) in Nigeria, the Toda-Yamamoto Causality test were utilised. Finding based on this test revealed

1 Unidirectional causality running from GRK to STM. These findings agree with Kirikkaleli (2020) study and Pradhan et al. (2020). However, STM cannot predict changes in GRK. This result is as expected.

2 Unidirectional causality was found from GDP to STM.

3 One-way causality was found running from STM to EXR.

Finally, the variance decomposition result revealed that global risk could predict a significant variation in the stock market.

5 Conclusions

This study's core purpose is to explore the interaction between global uncertainty and the stock market in Nigeria, utilising quarterly data ranging from January 2010 and December 2018 (2010_Q1-2018_Q12). To improve the model, this study introduces economic growth and exchange rate as the control variable. In achieving these aims, the ARDL, DOLS, FMOLS, and Toda-Yamamoto Causality tests were utilised. The finding of this study reveals that the ARDL bounds test shows evidence of cointegration in the long run between the stock market index and its determinants. It further shows that the stock market is negatively affected by global risk, while it is evident that economic growth positively influences the stock market in Nigeria. However, the exchange rate impacts on the stock market tend to be insignificant in the long run. Toda-Yamamoto Causality test reveals the following results:

1 unidirectional causality running from global risk to stock market

2 unidirectional causality was found from economic growth to stock market

3 one-way causality was found running from stock market to exchange rate.

Also, finding from the variance decomposition shows that in the 12-period (three-years), global risks account for 26.54% of the variation in the stock market. This shows that global risk significantly influences changes in the stock market in the long run. Premised on these findings, we recommend that precautionary policies be developed to minimise possible uncertainty that may arise in advance. Furthermore, the policy framework supported in the research has generalisability and, making it possible for other developing countries to use it as a benchmark. The limitation of this study is that other determinants of the stock market were not included in the model. Further studies should look into the global risk influence on the stock market for other emerging countries.

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