Asian Journal of Economics, Finance and Management

4(1): 555-566, 2022; Article no.AJEFM.1171

Analysis of the Effect of Foreign Exchange Market Returns of Emerging African Economies on Nigerian Stock Market Volatility

Nwulu Stephen Onyemere [a*], Emeka J. Okereke [a] and Samuel S. Ogunbiyi [a]

[a] Department of Finance and Banking, University of Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

Received 20 October 2022
Accepted 28 December 2022
Published 29 December 2022

ABSTRACT

This research analysed the effect of foreign exchange market returns of emerging African economies on Nigerian stock market volatility. It deployed weekly exchange rate data of the sampled foreign exchange markets and Nigeria Stock market All Share Index for the period. The Econometric tools used were the symmetric Generalised Auto Regressive Conditional Heteroskedacity (GARCH), Asymmetric Threshold GARCH and Power GARCH models. Results show that: Nigerian Stock market volatility was not evidently driven by the influence of the foreign exchange markets of the emerging economies. .The Nigeria stock market volatility is persistent with no asymmetric or leverage effect. Symetric GARCH was proven to have outperformed the other ARCH-type models. There is negative correlation between Nigeria Stock Market returns and Nigeria foreign exchange market and other African countries. The interactions among African Foreign exchange markets are poor. It is recommended that risk monitoring and assessment in the Nigeria stock market should be done with appropriate techniques for objectivity, exclusion of bias and optimal investment outcomes. This study has proven the plausibility of GARCH –type models if the volatility in the market must be described and captured.

Keywords: Nigerian stock market; foreign exchange market; volatility; returns; GARCH; TGARCH; power GARCH; all share index, emerging economies.

1. INTRODUCTION

Stock markets are essential components of a free-market economy because they enable access to trading and exchange of capital from investors of all kinds. It mirrors the overall economy. It is a marketplace for liquidity where investors trade. It works as a platform through which savings and investments of individuals are efficiently channelled into productive investment opportunities [1-5].

In the recent time, the Nigerian stock market has witnessed strategic jumps in both average

**Corresponding author;*

returns and risks (volatility). Markowitz (1952) assumes that in uncertain conditions, investors are concerned with risk and returns in portfolio selection; and these provide benchmarks for valuation. Sharpe [6] questioned the kind of relationship which exists between risk and return associated with securities and / or portfolios assuming the investors take the part of Markowitz. Stephen Ross [7] underscores the inclusion of macroeconomic factors as sources of risks which he classified as systematic. Dornbusch and Fisher [8] argue that exchange rate, a macroeconomic price variable, is a risk factor that affects the competitiveness of domestic companies and their future cash flows. This in turn impacts on the performance of their stock. Its volatility also affects business profitability, equity prices and stock market performance [9,10]. Bracker, et al (1999) posits that domestic economic variables, foreign factors and noise are in their various capacities sources of risk to the domestic stock market. In some cases, a combination of two or all of them prevail [11].

Between 2019 and 2021 the ASI increased by 60% to end with 42,716 points in 2021. An interesting development is that by end of July 2022 it has risen to 50,722 points; a further 17.92 % increase. See Fig. 1. Also, in the period between 2015 and 2019, the market's average return stood at -0.2079% (a negative return) with a low standard deviation of 1.027. Between 2019 and 2021, average return was 6.313% with standard deviation of 6.899. When the two periods are compared, we see an increase in average return by 3137 % and standard deviation by 572% (See Fig.2). This implies that investors gained about 3137% of their investments albeit with high risk (volatility) in the market. This is a shock. What is causing this jump (shock). This concern is significant as the two periods are two tenors of a single political regime in Nigeria. Is there something different that has occurred in the domestic economy or any event from the foreign markets or economies that has transmitted to the domestic stock market [12-20].

This paper seeks to investigate empirically the extent to which the performance of emerging African markets foreign exchange markets affect the volatility in the Nigeria stock market. Our sample comprises Nigeria, Ghana, South Africa, Kenya and Algeria.

In selecting the sample countries, we used the following criteria: a) its representative capacity in the economic zone, b) adoption/ implementation of a flexible exchange rate regime, c) adoption of direct exchange rate quotation system, d) a deep financial system that has relative channel efficiency, and e) Data availability. In a fixed exchange rate regime, the authorities fix the exchange rate. This removes the instability associated with the market. A flexible exchange rate is also known as floating, fluctuating, or free-floating exchange rate. The rate in this regime is determined by the interplay of market forces of demand and supply [21-25]. There's also a hybrid of fixed and floating in which the exchange rate is allowed to float within a given band. This is known as managed float. Volatility can only be witnessed and transmitted in flexible or managed float exchange rate regimes. In most countries of the world, the United State dollar serves as the reserve currencies, and this influenced the researcher's choice of using the rate that involves dollar against each countries domestic currencies [26-30]. In this case, direct quotation was necessary for uniformity and consistency [31-36]. In a direct quotation system, the foreign currency (dollar) is expressed in multiple units of the domestic currency. The foreign currency (dollar) is the base, and the domestic currency is the counter currency. The depth of each country's financial system will help in determining its channel efficiency in the transmission of monetary policy [37-41]. We note here that the channels- bank lending, interest rate, asset price and exchange rate- come to mind and very helpful. See Table 1 for classification by region, foreign exchange regime and quotation system.

Structurally, this paper is organized into four more sections. Section two discusses the review of relevant literature, including, conceptual, theoretical and empirical.. Section three describes the research methodology. It is sub divided into; data and variables, methods and models. Section four presents the data analysis and discussion. In section five, the summary and conclusion is discussed.

2. LITERATURE REVIEW

Yau & Nieh [42] examines the impact of the New Taiwan Dollar/Japanese Yen exchange rate on stock prices in Japan and Taiwan from January 1991 to March 2008. This study makes use of the recently developed threshold error-correction model (TECM) by Enders and Granger [Enders, W., Granger, C.W.F., 1998]. An example utilizing the term structure of interest rates illustrates unit-root tests and asymmetric adjustment. Cointegration and threshold adjustment are used

in the assumption that the variables' relationship is non-linear. The empirical data reveals that throughout the time period under study, there is a long-run equilibrium link between NTD/JPY and the stock prices of Japan and Taiwan. However, the financial market in Taiwan is the only one with an asymmetric threshold cointegration relationship. They further broaden our analysis by considering how the U.S. exchange rate specifically affects Taiwan's financial market. A long-term equilibrium and asymmetric causal links between the NTD/USD and Taiwanese stock prices are also discovered by this study. Furthermore, the findings of the TECM Granger-Causality tests indicate that there is no short-run causal relationship between the two financial assets taken into account in the circumstances of both countries. Though, in the long run, a positive causal relationship running from either the Japaan or US exchange rates to the stock prices of Taiwan strongly argues for the traditional approach.

Adjasi [43] examined the effect of macroeconomic uncertainty on Ghana's stock market volatility. There are two stages to the analytical process. The first stage uses the exponential generalized autoregressive conditional heteroskedasticity (EGARCH) model to estimate univariate volatility models for each macroeconomic variable, including the consumer price index (a proxy for inflation), exchange rate, money supply, interest rates, oil price, gold price, and cocoa price. The most recent squared residuals from the mean-conditional variance of macroeconomic variables are used as exogenous variables in the conditional variance equation of the stock price to estimate the second stage's volatility effect of macroeconomic factors on stock prices. The findings demonstrate that more volatility in interest rates and cocoa prices increases volatility in stock prices, while higher volatility in gold, oil, and money rates decreases volatility in stock prices.

Zakaria & Shamsuddin [44] used monthly data from January 2000 to June 2012 to evaluate the link between Malaysia's stock market returns volatility and five selected macroeconomic variables: GDP, inflation, exchange rate, interest rates, and money supply. The relationship between stock market volatility and macroeconomic volatility was investigated using bi-variate and multivariate VAR Granger causality tests as well as through regression analysis. The volatility was evaluated using GARCH (1,1) models. They didn't find much evidence to support the hypothesis that stock market volatility and macroeconomic volatility are related. Out of five macroeconomic factors, only interest rate volatility was found to be a Granger cause of stock market volatility. In contrast, only volatility in inflation was found to be a Granger cause of stock market volatility.. Granger does not believe that the volatility of macroeconomic variables as a whole is what affects the volatility of stock market returns. Only the volatility of the money supply is significantly related to the volatility of the stock market, according to the regression analysis's findings. Additionally, the volatility of the stock market is not highly correlated with the volatility of macroeconomic factors taken as a whole. The lack of institutional investors in the market may be to blame for the weak association between stock market volatility and macroeconomic volatility. It may also be a sign of investor knowledge asymmetry.

Lawal & Ijirshar [45] analyzed, using the Generalized Autoregressive Conditional Heteroskedascity (1.1) (GARCH) model, the relationship between exchange rate volatility and stock market performance. To investigate the effects of exchange rate volatility, a Vector Error Correction Model of stock market performance was computed. The available data, which covers the years 1986 to 2013, revealed that long-term exchange rate volatility has a strong negative impact on changes in the performance of the Nigerian stock exchange market. The pairwise granger causality test was used to establish the one-way nature of this relationship. The study suggests promoting fiscal policy and diversification to prevent subsequent external shocks because Nigeria's heavy reliance on oil is its main problem on the international market. It also suggests that manufacturing firms produce high-quality goods that draw international demand in order to have monetary and exchange rate control, and that remote causes should also be addressed like creating an environment that is conducive to business for both domestic and foreign investors.

3. METHODOLOGY

3.1 Data and Variables

Our sample comprises five emerging African Markets (Nigeria, Ghana, South Africa, Kenya, and Algeria). The consideration of these markets is based on data availability and other factors as stated in the background to this study; hence, the purposive (non-probability) sampling method is employed.

For empirical analysis, secondary data will be used. Specifically, the study is based on weekly exchange rate data for the sampled foreign exchange markets and Nigerian Stock market all share index data from 31/05/2009 to 30/11/2022. Data collected at weekly interval are used for two reasons. First is that weekly frequency reduces the problem of different opening and closing times associated with different time zones, and second is that weekly frequency minimizes the problem of missing observations due to holidays and market closing [46].

3.2 Method of Data Analysis

This study employed the univariate GARCH framework to examine the transmission effects of exchange rate returns on stock market performance. Specifically, we employ the symmetric GARCH model of Bollerslev [47] and the asymmetric Threshold GARCH and Power GARCH models of Zakoian's [48] and Ding, Granger and Engle [49] respectively. The univariate GARCH framework generally comprises two models: (1) mean model, and (2) variance model. While the mean model traces the evolution of market returns, the variance model focuses on the evolution of market volatility. The suitability/appropriateness of these models for our purpose has well been established in the literature.

4. DATA ANALYSIS AND DISCUSSION

4.1 Summary Statistics

4.1.1 Descriptive statistics – emerging African economy

Tables 1 and 2 show the summary statistics for weekly data for Nigeria stock index and five African foreign exchange markets (Nigeria, Ghana, South Africa, Algeria, and Kenya) from 31/05/2009 to 30/11/2022. Table 3 shows the correlation matrix for weekly returns. Figs. 1 and 2 show the time series graph for weekly prices and returns for Nigeria stock index and African exchange rates.

From Table 1, we can see that while Nigeria's all share index averaged at 31,692.4pts over the sample period, with 7,895.59 standard deviation, Nigeria exchange rate $(\bar{x} = 251.59, \sigma = 96.55)$against US dollar is the highest and the most volatile compared to South Africa $(\bar{x} = 12.04, \sigma = 3.29)$, Ghana $(\bar{x} = 3.91, \sigma = 2.16)$ Algeria $(\bar{x} = 11.42, \sigma = 5.36)$, and Kenya $(\bar{x} = 96.36, \sigma = 11.63)$.

Table 1. Summary statistics for weekly prices – African markets

Series	N	$\bar{x}$	σ	$SKEW$	$KURT$	Jarque-Bera
NSE_ASI	705	31692.40	7895.59	0.61	2.53	49.87***
NIGERIA	705	251.59	96.55	0.41	1.68	71.29***
GHANA	705	3.91	2.16	1.35	6.93	670.46***
SA	705	12.04	3.29	-0.14	1.79	45.81***
ALGERIA	705	101.87	23.66	0.14	1.37	59.08***
KENYA	705	96.36	11.63	-0.05	1.61	25.66***

*Source: Computed from Research Data ; ***indicates significance at 1% level*

Table 2. Summary statistics for weekly returns – African markets

Series	N	$\bar{x}$	σ	$SKEW$	$KURT$	Jarque-Bera
RTN_NSE	704	0.08	2.80	-0.13	8.90	1022.18***
R_NIG	704	0.16	1.85	10.41	186.20	997242.30***
R_GHA	704	0.31	1.82	1.06	35.98	32047.68***
R_SA	704	0.11	2.16	0.49	3.98	56.99***
R_ALG	704	0.09	0.61	1.07	8.91	1157.27***
R_KYA	704	0.06	0.68	-1.33	22.83	11745.10***

*Source: Computed from Research Data; ***indicates significance at 1% level*

Table 3. Correlation matrix for weekly returns – African markets

Correlation	1	2	3	4	5	6
RTN_NSE	1.00	-0.01	-0.08	-0.04	-0.03	-0.07
R_NIG	-0.01	1.00	0.02	-0.03	-0.01	-0.01
R_GHA	-0.08	0.02	1.00	-0.01	-0.02	0.00
R_SA	-0.04	-0.03	-0.01	1.00	0.24	0.15
R_ALG	-0.03	-0.01	-0.02	0.24	1.00	0.13
R_KYA	-0.07	-0.01	0.00	0.15	0.13	1.00

Source: Computed from Research Data

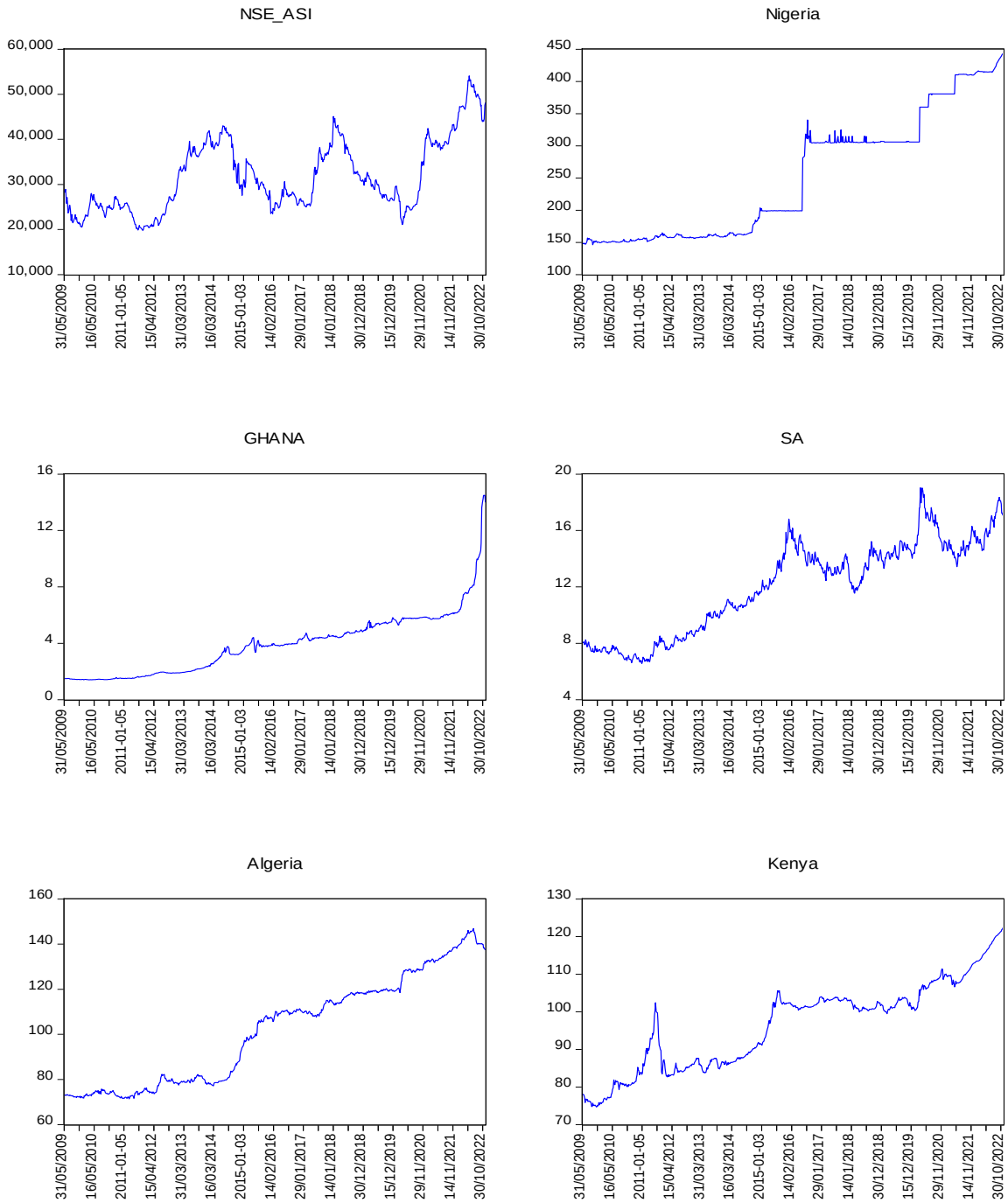

Fig. 1. Weekly Prices – Africa Markets

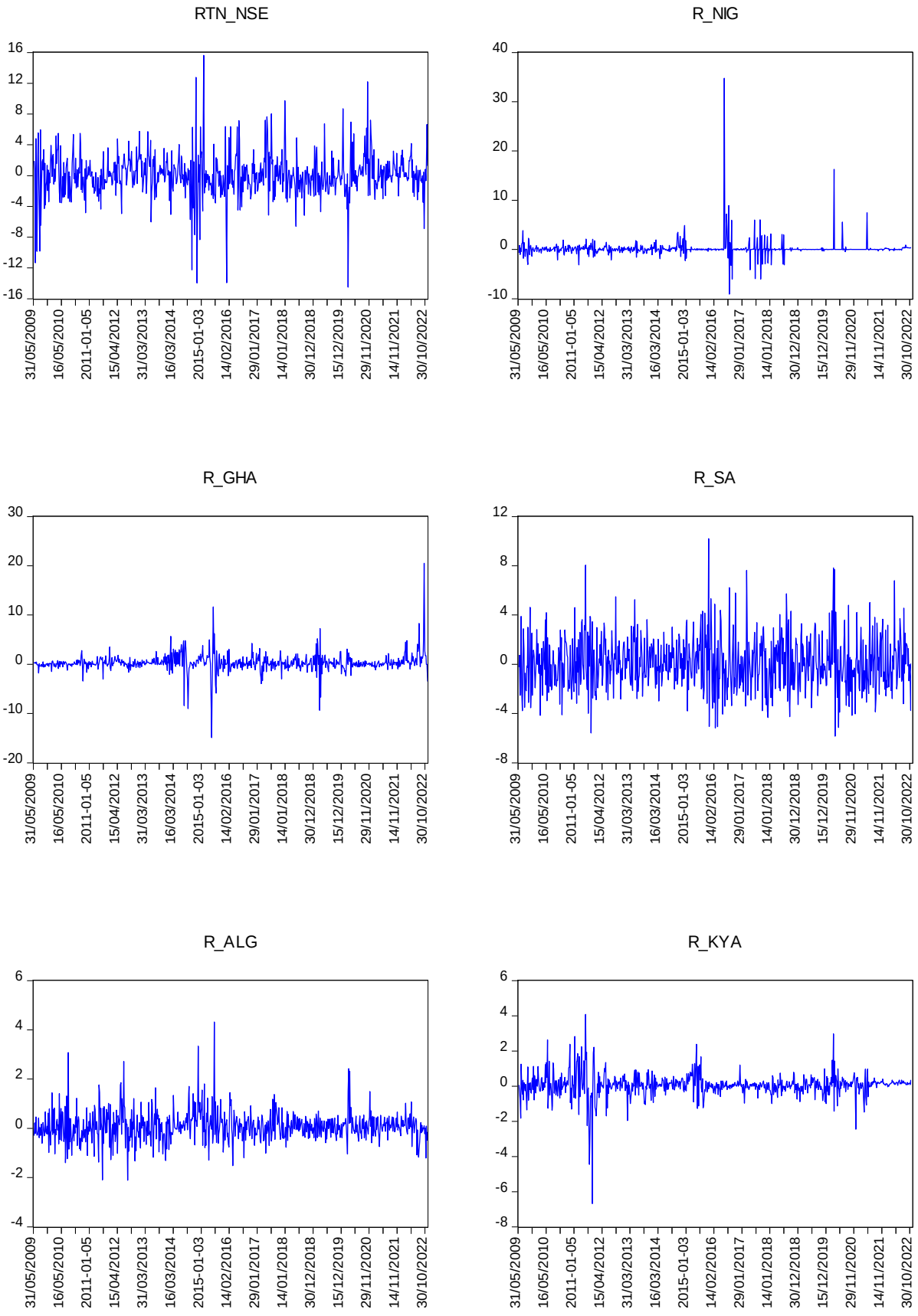

Fig. 2. Weekly returns – Africa markets

From Table 2, we can see that over the period under study, the weekly exchange rate returns for the four African countries are generally low, ranging between 0.06% and 0.31%. However, while the mean returns on Nigeria's All share index is also low at 0.08%, it is higher than the Kenyan exchange rate returns $(\bar{x} = 0.06\%)$ but lower than exchange rate returns for Nigeria $(\bar{x} = 0.16\%)$, South Africa $(\bar{x} = 0.11\%)$, Ghana $(\bar{x} = 0.31\%)$. and Algeria$(\bar{x} = 0.09\%)$. In terms of the statistical distribution of the returns data, we can see that none of the returns series is normally distributed as indicated by the Jarque-Bera statistics, which is highly significant in all cases. The non-normal distribution of the returns data is expected as it a typical feature of asset returns data which is generated by a continuously compounded process. This implies that our GARCH estimation and analysis would be based on a statistical distribution (such as generalized error distribution or student -t distribution) that accommodates this stylized fact.

From Table 3, we can observe that the correlation coefficients are all low, indicating poor interaction among the African markets. However, one striking feature of the results is the negative correlation between Nigerian stock returns and the exchange rate returns for both Nigeria and the other three African countries. This shows that the Nigerian stock market moves in the opposite direction with African foreign exchange markets. This also suggests that diversification benefit exists across these markets.

From Fig. 1, we can see that our weekly price and exchange rate data generally exhibit random walk behaviour, moving in a manner that is not predictable. However, structural breaks are also observable for Nigeria.

From Fig. 2, the stationarity of the returns data is clearly observable for all the African countries. Also, the Figure shows that volatility clustering is present in the returns data, which is a typical stylist fact for series that are generated by a continuously compounded process, and which is also the main attraction for GARCH-type models. Hence, GARCH models can plausibly describe most of the dynamic features of our research data.

4.2 Empirical Results and Analysis

4.2.1 Test of ARCH effect

As it is well known, the detection of ARCH effect in a continuously compounded data is the starting point for volatility analysis within the GARCH framework. Consistent with previous studies, we conduct the LM test at the 5% significance level under the null hypothesis of no ARCH effect in our stock returns and exchange rate returns data. A rejection of this hypothesis would imply evidence that the data exhibit ARCH effect and GARCH models can sufficiently capture most of the time-varying properties of all our weekly returns data. For all series, we include an intercept and two lagged values of the dependent variable in the basic regression equation, while 4 lags of the squared residuals are included in the test equation for optimal specification. The LM test results are presented in Table 4.

As Table 4 shows, the LM statistic is significant at the 1% level for most of the series, except R_NIG (p-value = 0.8508), which is not significant, and R_ALG (p-value = 0.0752), which is significant at the 10% level. Hence, for RTN_NSE, R_GHA, R_SA, R_KYA, there is strong evidence of ARCH effect or volatility clustering, while for R_ALG, there is weak evidence of ARCH effect. However, there is no evidence of ARCH effect in the weakly exchange returns for Nigeria. Hence, Nigerian exchange rate returns would not be included in our subsequent analysis. This implies that GARCH models can be used to capture most of the returns and volatility dynamics in most of our weekly series.

Table 4. ARCH Effect Test Results; Lag = 4

Returns Series	ARCH LM Statistic	P-value	ARCH Effect
RTN_NSE	30.7401	0.0000***	Yes
R_NIG	1.3619	0.8508	No
R_GHA	23.7504	0.0001***	Yes
R_SA	18.7970	0.0009***	Yes
R_ALG	8.4894	0.0752*	Yes (Weak)
R_KYA	23.3199	0.0001***	Yes

**indicates significance at 10% level; ***indicates significance at 1% level*

4.2.2 Estimation of GARCH models for Nigerian stock market and African foreign exchange markets

Table 5 presents the estimation results for the standard GARCH, TGARCH, and PGARCH models for the relationship between Nigerian stock market and African foreign exchange markets. For all models, we assume that the conditional errors follow student -t distribution, which is consistent with our earlier findings that all our weekly returns data have a fat-tailed or leptokurtic distribution. Panel A presents the results of the estimated mean or returns equation, while Panel B reports the results of the estimated conditional variance or volatility equation. In Panel C, we presented the model diagnostic tests. Brackets contain the associated probability values or p-values.

Table 5. GARCH model for Nigeria and African countries

Parameter	Standard GARCH	TGARCH	PGARCH
Panel A: Mean Equation			
λ	-0.0815 (0.4958)	-0.0811 (0.5000)	-0.1244 (0.2707)
ψ	0.2065 (0.4718)	0.2063 (0.4732)	0.2994 (0.2627)
ϕ	0.1090 (0.0053)	0.1090 (0.0053)	0.1063 (0.0061)
Panel B: Variance Equation			
α_0	0.7759 (0.0044)	0.7767 (0.0046)	0.3428 (0.0773)
α_1	0.1888 (0.0010)	0.1910 (0.0036)	0.2089 (0.0001)
γ	–	-0.0049 (0.9527)	-0.0562 (0.6780)
β_1	0.7258 (0.0000)	0.7257 (0.0000)	0.7367 (0.0000)
δ	–	–	1.1344 (0.0061)
$\alpha_1 + \beta_1$	0.9146	0.9197	0.9456
HLV	7.7647	7.7647	12.391
R_GHA	-0.0310 (0.7263)	-0.0305 (0.7332)	-0.0053 (0.8362)
R_SA	0.2470 (0.1238)	0.2478 (0.7332)	0.0559 (0.3658)
R_ALG	-0.2291 (0.6250)	-0.2266 (0.1259)	-0.0446 (0.7439)
R_KYA	0.2261 (0.2639)	0.2268 (0.6290)	0.0911 (0.3055)

Source: EViews Results Output

Table 6. Diagnostic tests for standard GARCH model

Diagnostic Tests	Standard GARCH	TGARCH	PGARCH
$v(T-DIST)$	3.8320 (0.0000)	3.8308 (0.0000)	3.8491 (0.0000)
Log Lik	-1597.60	-1597.60	-1596.81
AIC	4.5764	4.5792	4.5798
SIC	4.6476	4.6570	4.6640
$LM(4)$	2.5335 (0.6386)	2.5258 (0.6400)	3.7116 (0.4464)
Q -stat (4)	0.027 (0.110)	0.018 (0.112)	0.023 (0.105)

Source: EViews Results Output

From Table 6, we can see that both LM and Q-test statistics are not significant for all models, indicating evidence that the estimated GARCH models are free from both serial correlation and further ARCH effects. Hence, there are no misspecification problems in all the fitted models. Further, for all models, the degree of freedom of the student-t distribution $^{(v>2,p}$-value = 0.0000) is greater than 2 and is highly statistically significant, hence confirming our initial assumption that the estimated errors have a leptokurtic distribution. Hence, our analysis has provided strong evidence that a GARCH model with student-t distribution is a plausible description of the returns and volatility interactions between the Nigerian stock market and the foreign exchange markets of Ghana, South Africa, Algeria, and Kenya.

In terms of which model is the most appropriate for our weekly stock returns data, we compare the performance of the three models based on AIC (Akaike Information Criterion), SIC (Schwarz Information Criterion), and Log Lik(Log-Likelihood Function). While both AIC and SIC prefer a model that minimizes their values, Log Lik selects a model that corresponds to its maximum value. As we can see from Table 6, the standard GARCH model has the lowest AIC and SIC, as well as the highest log likelihood function, hence it outperforms the two asymmetric GARCH models.

From Panel A of Table 5, we can see that $^{\Phi}$ (p-value < 0.01), which captures the past behaviour of weekly stock returns, is positive and highly significant for all models, indicating that weekly stock market returns is sensitive to, and can be determined by, its own past behaviour. Hence, the market returns exhibit significant persistence and is predictable based on historical information or technical analysis. However, as shown by the high associated p-values, the coefficient on conditional variance $^{\lambda,}$ is not significant in all cases, which shows that stock market volatility is not among the determinants of stock market returns. This evidence contradicts the capital asset pricing model or CAPM which predicts a significant relationship between stock market volatility and stock market returns.

From Panel B of Table 5, the asymmetric coefficient, $^{\Upsilon}$, coefficient is estimated with a high probability for both TGARCH (p-value = 0.9527) and PGARCH (p-value = 0.6780) models, indicating that it is not statistically different from zero. This shows that the weekly returns on the Nigeria's All share's index does not exhibit asymmetric effects. This also shows that both positive and negative shocks of equal magnitude produce similar effects on volatility in the Nigerian stock market. Hence, contrary to the asymmetric or leverage effect theory, there is strong empirical evidence that standard GARCH model is the most appropriate framework for evaluating the market volatility dynamics in Nigeria.

Also, from Panel B of Table 5, we can see that for all models, both $^{\alpha_1(\mathrm{P}}$-value < 0.01) and $^{\beta_1(\mathrm{P}}$-

value < 0.01) coefficients have the expected positive (+) signs and are highly statistically significant, indicating that weekly stock returns volatility responds to both ARCH and GARCH effects. Also, the volatility persistence parameter, $\alpha_1 + \beta_1$, is less than 1 for all models, indicating that stock market volatility exhibits mean reversion. The estimated half-life volatility (HLV) is 7.7647 for the standard GARCH and TGARCH models, while it is 0.9456 for the PGARCH model. However, since the standard GARCH model outperforms both asymmetric GARCH models, we conclude that it takes approximately 8weeks for weekly returns volatility to returns halfway to its original point. Hence, our subsequent analysis would focus on the results of the standard GARCH model.

Turning to the effect of African foreign exchange markets on stock market volatility, we can see that although, the estimated exchange rate return coefficients have different signs for different countries, none of them is statistically significant. This shows that Nigerian stock market volatility, measured at weekly frequency, is not affected by African foreign exchange markets.

5. SUMMARY AND CONCLUSION

The objective of this research was to investigate empirically the extent to which the performance of emerging African countries foreign exchange markets affects the volatility in the Nigeria stock market. Our sample comprises Nigeria, Ghana, South Africa, Kenya, and Algeria.

The market returns for the research, which were generated by a continuous compounding process, exhibited the expected stylized features of volatility clustering and stationerity that made the deployment of Generalised Auto Regressive Conditional Heteroscedasticity (GARCH)-type models plausible. In the estimation of the relationship, we employed the symmetric GARCH model of Bollerslev [50] and the asymmetric Threshold GARCH and Power GARCH models of Zakoian's [48] and Ding, Granger and Engle [50] respectively. The univariate GARCH framework generally comprises two models: (1) mean model, and (2) variance model. While the mean model traces the evolution of market returns, the variance model focuses on the evolution of market volatility. Diagnostic test conducted on the plausibility of the above models shows superior performance of the symmetric GARCH over others. Symmetric GARCH was therefore used in our analysis.

Results show that all the African countries return series are not normally distributed; a typical feature of returns that are generated by a continuous compounding process. However, Nigeria foreign exchange returns series failed the ARCH effect test and consequently made its exclusion in the analysis compelling. All the correlation coefficients are low indicating poor interactions amongst African markets. There are negative correlations between the Nigeria stock market and the foreign exchange markets of African countries. They move in opposite directions. All the assets exhibited random walk behavior; an indication that the series are not predictable which makes its description by GARCH-type models plausible. The volatility in Nigeria Stock Market does not respond to asymmetric or leverage effects theory as good and bad news of same magnitude do not have effect on the activities of the market when predicted using weekly data. However, it responds to ARCH and GARCH effect. Nigeria Stock market returns exhibit significant persistence and is predictable based on historical information. The coefficient of conditional variance is not significant which shows that the stock market volatility is not among the determinants of stock market return. The estimated exchange rate coefficients have different signs for the different African countries but they are not statistically significant.

Our conclusion therefore is that the Nigeria stock market volatility measured at weekly frequency is not affected by African foreign exchange markets.

It was therefore recommended that risk monitoring and assessment in the Nigeria stock market should be done with appropriate techniques for objectivity and exclusion of bias. This study has proven the plausibility of GARCH –type models if the volatility in the market must be described and captured. And further research to explore the volatility of the other countries foreign markets to get their interactions with the volatility of the Nigeria Market.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lintner J. The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. Rev Econ Stat. 1965a;47(1):13-37.
2. Lipsey RG, Chrystal KA. Economics Oxford University Press; 2007.
3. Malik F. Volatility spillover between exchange rate and stock returns under volatility shifts. Q Rev Econ Fin. 2021; 80:605-13.
4. Mangram ME. A simplified perspective of the Markowitz portfolio theory. Glob J Bus Res. 2013;7(1):59-70.
5. Markowitz HM. The early history of portfolio theory: 1600-1960. Financ Anal J. 1999;55(4):5-16.
6. Sharpe WF. Capital asset prices: A theory of market equilibrium under conditions of risk. J Fin. 1964;19(3):425-42.
7. Ross SA. The arbitrage theory of capital asset pricing. J Econ Theor. 1976;13(3):341-60.
8. Dornbusch R, Fischer S. Exchange rates and the current account. Am Econ Rev. 1980;70(5):960-71.
9. Kim KH. Dollar exchange rate and stock price: evidence from multivariate cointegration and error correction model. Rev Financ Econ. 2003;12(3):301-13.
10. Agrawal G, Kumar Srivastav AK, Srivastava A. A study of exchange rates movement and stock market volatility. Int J Bus Manag. 2010;5(12):62.
11. Kirikkaleli D. The effect of domestic and foreign risks on an emerging stock market: A time series analysis. North Am J Econ Fin. 2020;51:100876.
12. Markowitz H. Portfolio selection. Investment under uncertainty; 1959.
13. Mossin J. Equilibrium in a capital asset market. Econometrica. 1966;34(4):768-83.
14. MSCI; 2020.
Available: http://www.msci.com/market-classification.
15. Nyopa T, Khumalo SA. Volatility spillovers in equity and foreign exchange markets: evidence from emerging economies. J Econ Financ Sci. 2022;15(1):14.
16. Ogbulu OM. Oil price volatility, exchange rate movements and stock market reaction: the Nigerian experience (1985-2017). Am Fin Banking Rev. 2018;3(1):12-25.
17. Pethe A, Karnik A. Do Indian stock market mater? Stock market indices and macroeconomic variables. Econ Pol Wkly. 2000;35(5):349-56.
18. Ross SA. A simple approach to the valuation of risky streams. J Bus. 1978; 51(3):453-75.
19. Ross SA, Westerfield R, Jaffe JF, Helmuth J. Solutions manual for use with corporate finance. Irwin: McGraw-Hill; 2002.
20. Solnik B. International arbitrage pricing theory. J Fin. 1983;38(2):449-57.
21. Engle RF, Bollerslev T. Modelling the persistence of conditional variances. Econ Rev. 1986;5(1):1-50.
22. Engle RF, Lilien DM, Robins RP. Estimating time varying risk premia in the term structure: the ARCH-M model. Econometrica. 1987;55(2):391-407.
23. Erdoğan S, Gedikli A, Çevik Eİ. Volatility spillover effects between Islamic stock markets and exchange rates: evidence from three emerging countries. Borsa Istanb Rev. 2020;20(4):322-33.
24. Granger CWJ. Investigating causal relations by econometric models and cross- spectral methods. Econometrica. 1969;37(3):424-38.
25. IInvestment Finance (2022).Retrieved from www.investing.com, on 30/11/22 Investopedia. Risk / Return trade off
26. Valls N, Chuliá H. Volatility transmission between the stock and currency markets in emerging Asia: the impact of the global financial crisis. Research institute of applied economics. 2014;31(1):1-26.
27. Yahoo Finance; 2022 [cited on 30/11/22]. Available: http://www.yahoofinance.com.
28. YEE CF, TAN EC. Banking sector stability and financial liberalization: some evidence from Malaysia. In: 43rd annual conference of the CEA; 2009.
29. Yeh CC, Chi CF. The co-movement and long-run relationship between inflation and stock returns: evidence from 12 OECD countries. J Econ Manag. 2009;5(2):167-86.
30. Zivot E. Practical issues in the analysis of univariate GARCH models. In Handbook of financial time series. 113-155. Berlin, Heidelberg: Springer; 2009.
31. Abu-Libdeh H, Harasheh M. Testing for correlation and causality relationships between stock prices and macroeconomic variables: the case of Palestine securities exchange. Int Rev Bus Res Pap. 2011;7(5):141-54.

32. Ali AO. Modelling exchange rate volatility of Somali shilling against US dollar by utilizing GARCH models. Int J Econ Financ Issues. 2021;11(2):35-9.
33. Andrikopoulos A, Samitas A, Kougepsakis K. Volatility transmission across currencies and stock markets: GIIPS in crisis. Appl Financ Econ. 2014;24(19):1261-83.
34. Amewu G, Owusu Junior PO, Amenyitor EA. Co-movement between equity index and exchange rate: fresh evidence from Covid-19 era. Sci Afr. 2022;16:e01146.
35. Bollerslev T. Modelling the coherence in short-run nominal exchange rates: a multivariate generalized ARCH model. Rev Econ Stat. 1990;72(3):498-505.
36. Chen N, Roll R, Ross SA. Economic forces and the stock market. J Bus. 1986;59(3):383-403.
37. Choi JJ, Elyasiani E, Kopecky KJ. The sensitivity of bank stock returns to market, interest and exchange rate risks. J Banking Fin. 1992;16(5):983-1004.
38. Encyclopaedia: https://www.nationsencyclopaedia.com>economies>Korea retrieved on September 24, 2022
39. Engle RF. Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. Econometrica. 1982;50(4):987-1007.
40. Engle RF. Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. Econometrica. 1982;50(4):987-1007.
41. Engle RF. Stock volatility and the crash of'87. Rev Financ Stud. 1990;3(1):103-6.
42. Yau HY, Nieh CC. Interrelationships among stock prices of Taiwan and Japan and NTD/Yen exchange rate. J Asian Econ. 2006;17(3):535-52.
43. Adjasi CKD. Macroeconomic uncertainty and conditional stock-price volatility in frontier African markets: evidence from Ghana. J Risk Fin. 2009;10(4):333-49.
44. Zakaria Z, Shamsuddin S. Empirical evidence on the relationship between stock market volatility and macroeconomics volatility in Malaysia. J Bus Stud Q. 2012;4(2):61.
45. Lawal M, Ijirshar VU. Empirical analysis of exchange rate volatility and Nigeria stock market performance. Int J Sci Res (IJSR). 2013;4(4):1592-600.
46. Bayoumi MT, Bui MT. Global bonding: do US bond and equity spillovers dominate global financial markets? International Monetary Fund; 2012.
47. Bollerslev T. Glossary to arch (garch. In in volatility and time series econometrics essays in honor of Robert Engle. MarkWatson, Tim Bollerslev and Je¤ rey; 1986.
48. Zakoian JM. Threshold heteroskedastic models. J Econ Dyn Control. 1994;18(5):931-55.
49. Ding Z, Granger CWJ, Engle RF. A long memory property of stock market returns and a new model. J Empirical Fin. 1993;1(1):83-106.
50. Bollerslev T. Generalized autoregressive conditional heteroskedasticity. J Econ. 1986;31(3):307-27.