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Foreign Exchange News Announcements and the Volatility of Stock Returns in Nigeria

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Abstract

This paper examines the effect of foreign exchange news announcements on the volatility of stock returns in Nigeria, using the daily closing All-Share Index from The Nigerian Stock Exchange from 2000 to 2015. We extended existing literature by augmenting the EGARCH econometric model with exchange news announcements to specify both the conditional mean and volatility equations. The empirical results revealed a positive and significant effect of exchange news announcements on stock market volatility in Nigeria under symmetric conditional variance. However, there was strong evidence of asymmetric effect with negative exchange news which caused volatility to rise more following a large price rise than following a price fall of the same magnitude. The total impact of bad news had more distabilising effect on volatility than good news. The sum of ARCH and GARCH coefficients ($\alpha + \beta = 0.9$) is approximately close to unity – indicating strong evidence of volatility persistence in the Nigerian stock market.

Keywords: Volatility, stock returns, exchange news, asymmetric, volatility persistence.
JEL Classification: C22, C58 & G12

1. Introduction

The nexus between foreign exchange news and the volatility of stock returns is central to financial and international economics as it provides insights for measuring the sensitivity of local and international stock market prices and return dynamics to foreign exchange news. The introduction of a floating exchange rate system in 1973, as an appropriate mechanism for foreign exchange allocation, has attracted notable research attention in the developed and

emerging economies – especially with respect to investigating the interaction between stock prices and exchange rate news. However, the available literature in this area of study gave mixed results as to whether exchange rate news influences stock prices. These controversies attracted researchers' attention to explore the association between exchange rate announcements and stock price volatility.

Foreign exchange news is an unscheduled macroeconomic announcement randomly released to the market by the relevant agencies (i.e. the Central Bank of Nigeria) to inform the public about the state of the economy. The announcement generates two effects: positive (good news) and negative (bad news). It is positive news if the good news is positively correlated with stock returns, and negatively correlated with volatility and vice versa. The paper therefore, investigates whether there are significant effects of the shocks from foreign exchange market on: stock returns; volatility of stock returns; and persistence in volatility of stock returns in Nigeria.

Admittedly, there is a considerable number of empirical studies on the impact of macroeconomic variables on stock returns and risk (volatility) in the context of Nigerian economy. Existing studies by Olweny and Omondi (2011), Akingunola (2007), Aliyu (2012), Izedonmi and Abdullahi (2011), Inyiama and Nwoha, (2014), Umoru and Osekoma (2013), on the one hand, treated information as static factors which entered into the market linearly (symmetrically) to generate normal distribution of stock returns and thus on their volatility. In reality, news rarely enters into the market symmetrically, thus, resulting into asymmetric problems which snowballed into market distortion which this paper intends to investigate. Similarly, despite the fact that Emenike and Okwuchukwu (2014), Osazevbaru (2014), Emenike (2010), and Olowe (2009) investigated stock market return volatility and macroeconomic variables in Nigeria, nonetheless, their studies could not account for the effect of uncertainties from foreign exchange in the context of news announcements on volatility of stock returns in Nigeria. This is obviously a gap investigated by this paper.

The focus of this study is to address critical questions as they relate to the effect of foreign exchange news announcements on the volatility of stock returns in Nigeria which include: (i) Do foreign exchange news announcement have a significant effect on stock returns in Nigeria? (ii) Do they have a significant effect on the volatility of stock returns? (iii) Is the news announcement effect different if volatility is asymmetric, i.e.does it respond differently to good news and bad news? (iv) Are shocks to stock returns volatility persistent in Nigeria?

The effect of foreign exchange announcements on the volatility of stock returns is a function of the state of the economy, the stability of the exchange market, and the content of the news (Fedorova, Wallenieus, and Collan, 2014; Rangel, 2009). Nigeria operates a monolithic economy with about 90% of its foreign exchange inflows from the sale of crude oil (CBN Annual Report, 2014). An increase in the price of the product at the international futures' market brings stability to the Nigerian foreign exchange market – with a positive effect on stock returns.

The Nigerian Stock Exchange serves approximately five million investors spread across the world. Onyema (2012) states that 77% of total transactions and 81% of cash inflows to the market are attributed to foreign investors. Foreign investors are attracted by two major factors: the expected returns on investment, and the stability in the foreign exchange market. A stable exchange market coupled with high returns in the equity market stimulates the patronage of foreign investors, and thus attracts an inflow of foreign capital for portfolio investments. On another matter, countries with the capacity to generate a high volume of foreign exchange through the export of goods and services, may have a positive effect on stock returns.

Devaluation (depreciation) of the Nigeria currency tends to boost international capital flows for share acquisition and stimulates the export of locally produced goods (except crude oil) – with the effect of increasing corporate profits which results in higher stock prices in the short run. This is generally more applicable to economies with a manufacturing export orientation. However, the Nigerian economy is contrarian because it is import-dependent. Depreciation of the Nigeria currency may not boost exports, but instead, makes the cost of production higher and exports expensive – resulting in poor corporate performance and a decline in stock prices (Fang & Miller, 2002). A price shock at the international futures market (bad news) is expected to have negative effects on the foreign exchange reserves, and, by extension, on stock returns.

Nigeria is an import-dependent nation where both household goods and services and firms' raw materials are imported from other countries. These are mostly from: China, Europe, the USA, Japan, India, and South Korea. The greater the dependence on imported goods and services without a corresponding increase in the price of exports, the higher the rate of depletion of foreign exchange reserves, and the lower the demand for equities. This is worse – especially when the price of crude oil has plummeted dramatically, with a negative effect on the current account and balance of payments – resulting in exchange rate volatility.

Nigeria dependence on imported goods and services is largely due to her lack of any sustainable policy, programmes, infrastructure, and the power needed for industrialisation. Nigeria is currently generating energy of less than 4,000 mw, which is insufficient for the residential needs of an estimated population of 170 million people. The demand for imported goods and services and raw materials by households and firms may persistently weaken the strength of the Naira (depreciation) at the expense of foreign currencies. The high cost of raw materials equally tends to reduce operating profitability of local firms – with a negative effect on stock returns.

Coupled with the aforementioned fact, Nigeria is one of the most corrupt nations in the world (Mohammed, 2013; Martini, 2014). The looted money is usually exchanged for foreign currencies, and is transferred out of the country for different personal purposes. These corrupt practices overstretched demand for foreign currencies – with its depreciation effect on the Naira, which may negatively affect stock returns. Besides, the incessant vandalisation and bombing of oil and gas pipelines by militants in the Niger Delta region also reduces the volume of crude-oil production and consequently, the foreign exchange needed to fully implement the country's budget.

Also, the phobia of the possible change of Nigeria currency has compelled many Nigerians to hold their cash in foreign currencies. Consequently, rising demand for foreign currencies account for the incessant depreciation of naira. Also, many Nigerians have recourse to holding their cash in foreign currencies driven by speculative motive resulting from the instability in the value of Nigerian currency. Thus, this speculative motive might account for naira depreciation with probable effect on volatility of stock returns.

Wherever an exchange market is volatile, however, high stock returns may not attract foreign investors – especially if the volatility is high enough to wipe away stock returns. Therefore, foreign exchange news as one of the components of macroeconomic announcements is a form of systematic risk (Cakan, 2012; Sharpe, 1964) and an important source of volatility (Gurkaynak *et al*., 2005). It partly provides information upon which market participants respond in order to make investment decisions.

The existing literature exhibits a heterogeneous response of security returns and volatility to exchange news announcements in different market economies. Some news has a strong impact on asset prices and others do not (Torrecillas & Jareno, 2013). The response of stock prices and volatility to foreign exchange news announcements is a key interest for making relevant financial and economic decisions such as: asset pricing and allocation, risk management, portfolio construction and management, and providing important implications for monetary policy (Rangel, 2009).

1.1 Foreign Exchange in Nigeria

The history of foreign exchange in Nigeria can be traced to the establishment of the Central Bank of Nigeria (CBN) in 1958 and the enactment of the Exchange Control Act of 1962 – to ensure efficient distribution of foreign exchange among the various units of the economy. Nigeria operated a fixed exchange mechanism before the introduction of the floating exchange system in 1986 under the Structural Adjustment Programme (SAP). The fixed exchange system was inefficient for achieving the internal balance goal. The introduction of the market-determined exchange system gave birth to the Second-Tier Foreign Exchange Market (SFEM) in 1986, where market forces became the determinant of the Naira exchange rate and allocation of foreign exchange. In 1989, the Bureaux de Change (BDC) was introduced to stimulate the foreign exchange market to deal in privately sourced foreign exchange. There was the introduction of other reforms into the Foreign Exchange Market in 1994 that resulted from certain volatilities in the market. These reforms were the formal pegging of the Naira exchange rate, the centralisation of foreign exchange in the CBN, the restriction of BDC to buy foreign exchange as agents of the CBN, the reaffirmation of the illegality of the parallel market, and the discontinuation of open accounts and bills for collection as a means of payments. (CBN Statistical Bulletin, 1994).

The Foreign Exchange Market was liberalised in 1995 with the introduction of an Autonomous Foreign Exchange Market (AFEM). In 1999, an Inter-bank Foreign Exchange Market (IFEM) was introduced for the sale of foreign exchange to end-users by the CBN through appointed authorised dealers at a market-determined exchange rate (CBN Annual Report, 1995, 1999). In the same 1999, BDC was accorded greater status in 1999 as authorised buyers and sellers of foreign exchange. As part of the reforms, the foreign exchange market was further liberalised with the reintroduction of the Dutch Auction System (DAS) in July 2002 – with the goals of realigning the Naira exchange rate, conserving external reserves, enhancing market transparency, and curbing capital flight from the country. Under this system, the Bank intervened twice weekly, and end-users through authorised dealers bought foreign exchange at their bid rates. The rate that cleared the market (marginal rate) was adopted as the ruling exchange rate for the period – up to the next auction. DAS brought a good measure of stability to the exchange rate and a reduction in the arbitrage premium between the official and parallel market rates (CBN's compendium of Monetary Policy Communiqués, 2013).

Despite the various measures introduced to achieve the main objectives of Nigeria's foreign exchange policy of preserving the value of the domestic currency, maintaining a favourable external reserves' position and ensuring external balance without compromising the need for internal balance and the overall goal of macroeconomic stability – the exchange rate has witnessed serious volatility. For instance, since the introduction of the flexible exchange rate in 1986, it has moved from N0.7/$ in 1980 to N197/$ in 2015. In an attempt to defend the stability of the exchange rate of the Naira against the US dollar, the CBN intervened on several occasions by increasing the supply of dollars to satisfy the currency needs in the

country. Whenever this supply of dollars by CBN falls short of the amount of dollars generated during the period, there would be the need to deplete existing foreign reserves in order for the CBN to meet local foreign currencies demand, thereby signaling the devaluation effect on the local currency. This situation tends to generate foreign-exchange volatility, with a negative effect on stock prices.

2. Theoretical Review

The classical economic theory explains the linear relationship between the stock market performance and the exchange rate behaviour in three contexts, as follows:

2.1 Flow-Oriented Models

The flow-oriented economic theory by Dornbusch and Fisher (1980) assumes that a country's current account and trade balance performance are the two important determinants of exchange rate. An increase in the current account and trade balances of a country generates lower volatility, with greater prospect for stock price increase. The current account and trade balances cover trade balances in respect of the differences between the imports and exports of goods, services and transfer payments. When the value of exports is more than imports, the difference increases foreign reserves (good news) – with a positive effect on stock prices. On the other hand, when the value of imports is greater than exports, the difference depletes foreign reserves, with a negative effect on stock prices. The value of imports and exports can be affected by the exchange rate. A devaluation of local currency makes exports become cheaper and imports expensive – only for industrialised countries. Cheaper exports stimulate demand for local goods and services and consequently increases net foreign inflows and stock prices, and vice versa. However, the manner in which currency movements influence a firm's earnings (and hence its stock price) depends on the characteristics of that firm. Import-dependent firms tend to suffer corporate losses on the devaluation of local currency. However, the depreciation of Nigerian currency (since Nigeria is import dependent) has not been favourable in boosting exports, as Nigerian goods and services are not competitive in the international markets. This is due to the weak production capacity base as a result of infrastructural decay (electricity and good roads).

2.2 The Stock-Oriented Models

The stock-oriented or portfolio balance theory of Brandson, Halttnen and Masson (1977) emphasises the capital account as the major determinant of exchange rate. The capital account consists of foreign direct investment, portfolio investment, other investment, and the reserve account. The capital account is the difference between the change in foreign ownership of domestic assets and the change in domestic ownership of foreign assets. Brandson et al. (1977) postulate an inverse association between stock-market prices and exchange rate. An increase in local bourse prices stimulates foreign capital inflows, which increases demand for local currency and causes exchange rates to appreciate, and vice versa. The degree to which stock-orientated models actually explain real world stock and currency market reactions, is critically dependent upon issues like stock market liquidity and segmentation.

2.3 Single-Index Factor Model

The capital asset pricing model (CAPM) proposed by Sharpe (1964) can be modified into a Single-Index Factor model to explain the theoretical relationship between macroeconomic factors proxied by exchange rate announcements and stock returns, as shown below:

$$R_i=E(R_i)+\beta_i F_1+\varepsilon_i \quad (2.0)$$

In a Single-Index Factor Model, the actual return on firm (R_i) is a linear function of the expected return or risk free rate $E(R_i)$ on stock I – plus a random amount attributed to unanticipated foreign exchange events (B_i F_1), plus a random amount ascribed to firm-specific events (ε_i).

2.4 Empirical Evidence

To provide empirical evidence on the relationship between exchange rates and stock prices, several studies have been conducted in the past three decades. Aggarwal (1981) examined the interplay between exchange rates and stock prices by looking at the correlation between changes in the US trade-weighted exchange rate and changes in US stock market indices each month – for the period 1974 to 1978. He found that the trade-weighted exchange rate and the US stock market indices were directly related in the period concerned. In contrast, Soenen and Hennigar (1988) established a significantly negative correlation between the effective value of the US dollar and changes in US stock prices between 1980 and 1986. Ma and Kao (1990) examine the relationship between exchange rates and stock prices in six industrialised economies namely the UK, Canada, France, West Germany, Italy and Japan. Their findings were consistent with the flow model, leading to the conclusion that the association between exchange rates and stock prices is a function of the level of a country's economy dependence on exports and imports. Ajayi and Mougoue (1996) indicated that an increase in the aggregate domestic stock price has a negative short-run effect on domestic currency value. In the long run, however, increases in stock prices have a positive effect on domestic currency value. Ajayi et al. (1998) also examined seven advanced markets and eight Asian emerging markets, and found that stock and currency markets are well integrated in the advanced economies – with the direction of causality running from stock returns to exchange rates.

Aloui (2007) extended the Multivariate (EGARCH) model of asymmetric volatility and causality transmission to examine price and volatility spillovers between exchange rates and stock indexes for the United States and some major European markets pre- and post the Euro period. The results support the asymmetric and long-range persistence volatility spillover effect, and shows strong evidence of causality in the mean and variance between foreign exchange rate and stock price for both pre- and post-Euro periods. Yaya and Shittu (2010) show that exchange rate has positive and significant effects on the volatility of stock returns in Nigeria. Chkili (2012) used BEKK-MGARCH models to explore the dynamic relationship between exchange rates and stock prices for some emerging countries: Hong Kong, Singapore, Malaysia, South Korea, Indonesia, Argentina, Brazil and Mexico. Empirical evidence shows a significant mean transmission from the foreign exchange market to the stock market in most emerging countries, and, usually, shocks and volatility spillovers between the two markets are bidirectional. Stefanescu and Dumitriu (2013) use GARCH models to investigate the impact of foreign exchange rate variation on stock returns and volatility of stock prices in the Rumanian capital market from January 2000 to December 2012. They divided the period into four sub-samples to represent different stages of the

Rumanian financial market evolution. They found no evidence of foreign exchange market on the Bucharest Stock Exchange between 2000 and 2007. A significant impact of exchange rates on stock returns was however found during the time of Rumania's inclusion in European Union and the announcement of the Lehman Brothers' bankruptcy. Foreign exchange was found to significantly influence both stock returns and volatility between September 2008 and February 2010. Finally, between March 2010 and December 2012, the impact of the foreign exchange on the Rumanian capital market was significant only on stock returns.

3. Research Methodology

This paper adopted an *ex-post facto* research design using a high-frequency daily closed time series All-Share Index obtained from The Nigerian Stock Exchange (NSE) from January 3, 2000 to December 31, 2015 covering 3940 observations, while the foreign exchange news proxy by the dummy variable was obtained from the Central Bank of Nigeria. We assigned 1 ('one') on the day of announcement and 0 ('zero') on other days. Descriptive statistics of the historical daily closed index into mean, standard deviation, skewedness and kurtosis considered for first, second, to fourth moments provide an overview of the behaviour of the stock indices.

The log difference of the stock market index is used to obtain the market returns which are further subject to a diagnostic test to determine whether the GARCH model is best-fitted. The study applies the Jacque Berra test for normality, BDS for linearity, Box Jenkins for correlation, ARCH-LM for heteroskedasticity, Skewness for asymmetry, and kurtosis for fat-tailed. The study uses the GARCH model proposed by Bollerslev (1986) and its large extension the EGARCH model by Nelson (1991) – to capture the leverage effect in the volatility of stock returns.

3.1 Model Specification and Estimation

An ARMA (1,1)-EGARCH econometric models is used to specify both the conditional mean and the volatility equations respectively augmented with the exchange news announcements. The Maximum Likelihood Estimation technique was applied to estimate the parameters under Students' *t*-distribution at the 5% significance level, using the OxMetrics 6.3 econometric computer software package for the analysis.

3.1.2 Measurement of Daily Market Returns

Before application of the GARCH models, the first step is to transform the index from its level form, by taking its first difference to enable us obtain a change (stock return) and then purge the data series from the presence of unit roots. Equation 3.0 can be expressed in level form, where the logarithm of stock market index at period *t* is related to the index at period *t-1* – as shown below:

$$R_t = \ln\left[P_t / P_{t-1}\right] \tag{3.0}$$

Where: R_t is the stock return at time t, ln (P_t) is the natural log of the daily market index at time (t) and ln (P_{t-1}) at time (t-1).

3.1.3 Measuring Autoregressive/Conditional Returns

In order to obtain a conditional mean, consider the model in equation 3.1 below:

$$R_t = \mathrm{E}(\Omega_{t-1}) + \varepsilon_t \quad (3.1)$$

where *E(.|.)* denotes the conditional expectation operator, R_t indicates a time series of All-Share Index (ASI) returns at time t, $\Omega_{t-1}$is the information available at time *t-1*, and ε_t is the random innovations (surprises) with $E(\varepsilon_t)=0$
In a time-series regression of stock-market index return, it is not uncommon to find that the stock return in the current period depends – among other things – on the stock return of the previous period, which, in this case, equation 3.1 can also be expressed as:

$$R_t = \mu + \lambda_i R_{t-1} + \varepsilon_t \qquad i = 0,2 \ldots T \quad (3.2)$$

Equation 3.2 is known as the autoregressive process of first-order deference AR (1) because the explanatory variable (R_{t-1}) is the lagged value of the dependent variable (R_t). To develop a more general autoregressive process, the first step is to estimate an autoregressive model of order p, and AR (p) as stated thus:

$$R_t = \mu + \sum_{i=1}^{p} \lambda_i R_{t-1} + \varepsilon_t \qquad \text{i=1, 2,...,p} \quad (3.3)$$

Where p is the number of autoregressive terms or the lag order of the autoregressive process, which must be determined by any of these information criteria: AIC Schwartz (1978), Maximum Likelihood Test, Root Mean Squared Error (RMSE); μ is a constant, and the random variable ε_t is white noise $\varepsilon_t \sim \mathrm{N}(0,1)$ which is assumed to be normally distributed.

3.1.4 Estimating Conditional Returns with Exchange News Announcements

Equation 3.3 is extended here to accommodate effects of exchange news announcements on stock returns – as shown in equation 3.4 below:

$$R_t = \mu + \lambda_i R_{t-1} + \psi_i \mathrm{MEX\Delta N}_t + \varepsilon_t \quad (3.4)$$

Where ψ_i represents the parameter for macroeconomic exchange news and $\mathrm{MEX\Delta N}_t$ is dummy for exchange news at announcement day t. The coefficient ψ_i can be negative (bad news) when $\psi_i<0$, or positive (good news) when $\psi_i>0$. Negative (positive) exchange news is expected to have a corresponding negative (positive) effect on stock returns. However, where $\psi_i=0$, it indicates that exchange news have no effect on stock returns. The coefficient of the autoregressive lagged returns (R_{t-1}) is represented by λ_i. If $\lambda_i>0$, it indicates that the present return is positively related to the past returns. It is negatively correlated if $\lambda_i<0$, and there is no correlation when $\lambda_i=0$.

3.1.5 Conditional Variance

The study examines the effects of volatility on stock returns using the generalised form of the ARCH model proposed by Bollerslev (1986) – as shown in equation 3.5 below:

$$\sigma_t^2 = \omega + \alpha_i \varepsilon_{t-1}^2 + \beta_i \sigma_{t-1}^2 \quad (3.5)$$

where σ_t^2 represents the conditional variance of ASI at time *t*, ω is an intercept, while α_i is the ARCH coefficient and $\varepsilon_{t-1}^2$is the ARCH term which is typically interpreted as the measures of the impact of recent news on volatility. β_i measures the persistence effect or the GARCH coefficient which measures how long it takes for shocks to conditional variance to die out; and $\sigma_{t-1}^2$is the GARCH term.

3.1.5.1 Exchange News Announcement on Volatility (without asymmetry effect)

This study extends Bollerslev's (1986) GARCH model to incorporate the effect of exchange news ($\mathrm{MEX\Delta N}_t$), as shown below:

$$\sigma_t^2 = \omega + \alpha_i \varepsilon_{t-1}^2 + \beta_i \sigma_{t-1}^2 + \mathrm{MEX\Delta N}_t \quad (3.6)$$

3.1.6 Conditional Volatility (with asymmetry effect)

In order to capture the effect of asymmetric volatility, Nelson (1991) introduced Exponential Generalized Autoregressive Conditionally Heteroskedasticity (EGARCH) model. The EGARCH serves as an extension to the GARCH model proposed by Bollerslev (1986) to overcome some weaknesses related to the GARCH model in handling financial time-series (Fedorova et al., 2013). The Nelson (1991) E-GARCH model is shown in equation 3.7 below:

$$\ln(\sigma_t^2) = \omega + \alpha_i \left[\frac{|\varepsilon_{t-1}|}{\sigma_{t-1}^2} - \sqrt{\frac{2}{\pi}} \right] + \gamma_i \frac{\varepsilon_{t-1}}{\sigma_{t-1}^2} + \beta_i \ln(\sigma_{t-1}^2) \quad (3.7)$$

In the log-conditional variance $\ln(\sigma_t^2)$ equation (3.7), there are four parameters to be estimated: ω, $\alpha_i, \gamma_i, \beta_i$, where ω, $\alpha_i, and\ \beta_i$ are as previously defined, while the coefficientγ_ii measures the asymmetric effect or leverage effect of exchange shocks on volatility of stock returns. The presence of asymmetric effects can be tested by the hypothesis that γ_i=0, if γ_i= 0, it implies a symmetric effect where positive and negative shocks of the same magnitude have the same effect on the volatility of stock returns. In this case, there is no leverage effect. The effect is asymmetric if $\gamma_i \neq 0$. If γ<0 the expectation is that bad news would have higher impact on volatility. Conversely, when γ>0, positive innovations are less destabilising than negative innovations. However, the total effects of good news is defined as $(1+ \gamma_i)|\varepsilon_{t-1}|$, and bad news is defined as $(1- \gamma_i)|\varepsilon_{t-1}|$

3.1.6.1 Exchange News Announcements and the Volatility of Stock Returns (with asymmetry effect)

The EGARCH model proposed by Nelson (1991) is extended to include parameters for exchange as shown in equation 3.8 below:

$$\ln(\sigma_t^2) = \omega + \alpha_i \left[\frac{|\varepsilon_{t-1}|}{\sigma_{t-1}^2} - \sqrt{\frac{2}{\pi}}\right] + \gamma_i \frac{\varepsilon_{t-1}}{\sigma_{t-1}^2} + \beta_i \ln(\sigma_{t-1}^2) + \eta_2 \mathrm{MEX\Delta N}_t \quad (3.8)$$

4. Empirical Results

The daily evolution of stock market returns is examined with respect to its mean, standard deviation, normality, autocorrelation, linearity, and heteroskedasticity – over a limited time window of 4 January 2000 to 31 December 2015. The results are presented in table 4.1 (below):

Table 4.1

Descriptive Statistics of Stock Market Returns in Nigeria from 4 January 2000 to 31 December 2015

D/Stats	Mean	Std. Dev.	Skewness	Kurtosis	JB	BDS	ARCH -LM	ADF
Results	0.0005	0.0112	0.67	28.35	105910*	0.0542*	717.26*	-3.432*
P-value					0.000	0.000	0.000	0.000

Note that std. dev., JB, BDS, ARCH-LM, and ADF are: standard deviation, coefficient of determination, Jacque-Berra, Brock-Decherd-Scheikman, Autoregressive Conditional Heteroskedasticity–Lagrange Multiplier and Augmented Dickey Fuller statistics respectively, at 1% significant (*) level.

Table 4.1 revealed that the average daily stock returns in Nigeria are approximately low at 0.05%, when compared to the higher risk measured by standard deviation which also stood at an average of 1.1% daily – suggesting the high volatility of the stock returns. If annualized, the stock returns translate into 12.5% for 250 trading days. The skewness and kurtosis values of the daily returns stood at 0.67 and 28.35 respectively. This means that the return is characterised with asymmetry and fat-tail, as the kurtosis is greater than the normal 3.0 standard.

The JB of 105910, which is significant at 1%, suggests rejecting the null hypothesis that the stock market return is normally distributed – and accepting the alternative hypothesis that the returns are not normally distributed, which is desirable for the study. The BDS and ADF statistics are both significant at 1%. These suggest that the stock-market returns are characterized by non-linear serial dependence and appear to be stationary series. The ARCH-LM is significant at 1%, indicating an ARCH effect for the stock-return series. Hence, we accept the alternative hypothesis that the stock returns are heteroskedastic.

Overall, the study revealed that the historical daily stock returns in Nigeria exhibited asymmetry, fat-tail, non-linear dependency, and reversibility. Going forward, on the basis of the above statistical distributions of the stock returns – the data best fit for GARCH and EGARCH models.

Figure 4.1

Movement of NSE All-Share Index at Integrated level Zero

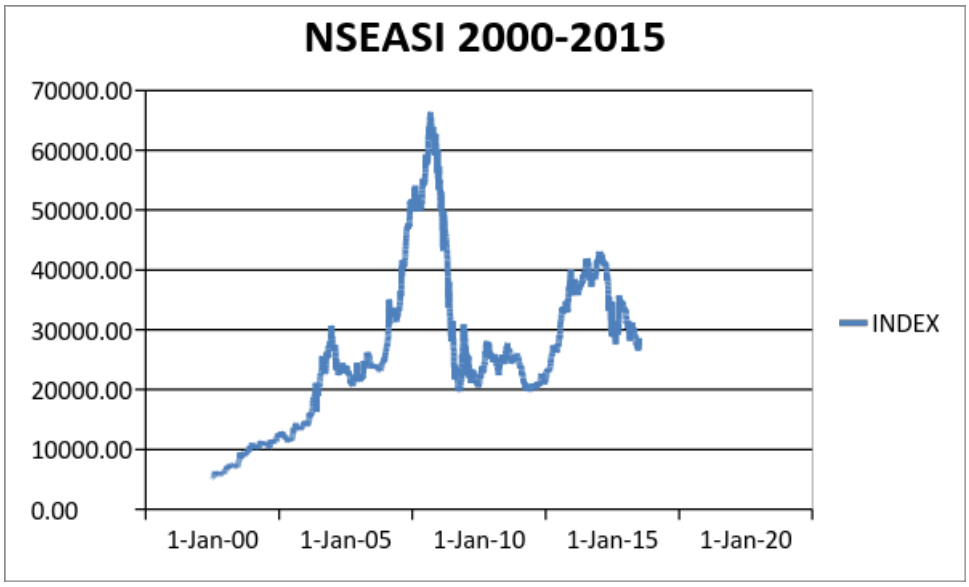

Figure 4.1 (above) shows the movement in the Nigerian stock exchange All-Share Index, which gradually increased from 5,306.99 in year 2000 to 28,797.03 in June 2004 – and fell from this level to 22,395.27 in December 2004. The index was influenced by the surge from bank recapitalisation in 2005 through margin facility to private sector. The index attained its highest level on 5 March 5 2008 at 66,371.20 points. The global financial crisis then drastically plummeted the index to 20,373.68 in March 2009. The index remained slightly above 20,000 points from 2009 to 2012 – due to the lingering effect of the global financial crisis. This trend was reversed from 2013, to peak at 41,474.40 on 30 May 2014, and, from there, it follows a downward trend to 31 December 2015. However, the peculiar characteristic of the index is that it is white noise and it has to be differenced to obtain market return.

Figure 4.2 (below) purged the random movement characterising the index in Figure 4.1, transformed it to first difference or return clustering with large changes in stock returns, followed by large changes and small shocks of both signs following small shocks in consistent with Mandelbrot (1963).

Figure 4.2

Movement of Stock Market Returns from 4 Jan 4 2000 to 31 December 2015

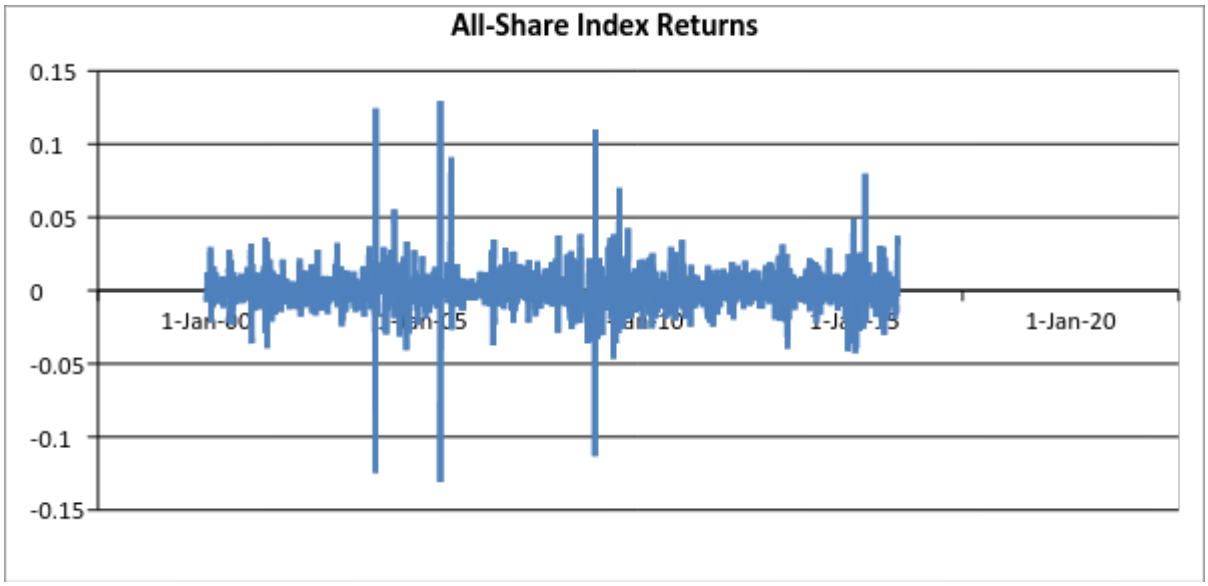

Table 4.2

Exchange Announcements and Volatility of Stock Returns (without Asymmetry Effect)

Variable	Coefficient	Std. Error	t-value	p-value
Cst (ω)	0.000048	0.000001532	31.33	0.0000
EXΔN(M)	0.00005	0.0000084275	5.658	0.0000
ARCH (α)	0.10000	0.014555	6.87	0.0000
GARCH (β)	0.80000	0.019854	40.29	0.0000

Source: Summarised from OXmetrics 6.3

Table 4.2 (above) measures the effect of exchange news on the volatility of stock returns without asymmetric effect. The results revealed that exchange news positively and significantly affect stock market volatility in Nigeria under symmetric conditional variance. As evidenced by the ARCH parameter (α), exchange news about volatility from the previous day has explanatory power on current volatility. In the same vein, the significance of the GARCH coefficient (β) does not only indicate explanatory power on current volatility but also suggests volatility clustering in the daily returns of the Nigerian stock exchange. The lagged conditional variance estimate (β) has parameter 0.80 indicates that 80% of exchange shocks variance remains the next day. There is a strong evidence of volatility persistence (α + β = 0.90) – suggesting that shocks to the conditional variance of stock returns have a long period to decay. This long period of volatility persistence might account for the weakening and loss of investors' confidence in the market.

Table 4.3

Exchange Announcements and Volatility of Stock Returns (with Asymmetric Effect)

Variable	Coefficient	Std. Error	t-value	p-value
Cst (ω)	0.040000	0.39222	0.1020	0.9188
EXΔN(M)	-0.000038	0.000017385	-2.159	0.0309
ARCH (α)	0.107148	0.059914	1.788	0.0738
GARCH (β)	0.981795	0.000962	11.102	0.0000
EGARCH (γ)	-0.340691	0.060046	-5.674	0.0000

Source: Summarised from OXmetrics 6.3

Table 4.3 (above) shows that exchange news is negative and significant when asymmetric effect is considered. The leverage effect is -0.340691 and significant at 1% – suggesting that the negative exchange news caused volatility to rise more following a large price rise than following a price fall of the same magnitude. However, on the basis of $\gamma = -0.340691$, it indicates that the impact of good news effect on volatility as defined by $(1 + \gamma)|_{\varepsilon t-1}|$ translated into 0.659309 compared to the total effects of bad news defined by $(1 - \gamma)|_{\varepsilon t-1}|$, which translated into 1.340691 which also indicates that bad news generates more volatility than good news. This is consistent with Nelson (1991); Atoi (2014). The sum of ARCH and GARCH coefficients (1.09) was relatively above unity – an evidence of volatility persistence attributed to exchange rate news. The asymmetric parameter revealed how this volatility reacts with exchange news.

5. Summary, Discussion, Conclusion and Recommendations

Given the empirical findings, the presence of ARCH effect is evident in the stock returns in the Nigerian stock market. Under symmetric conditional variance, exchange news positively and significantly affect stock market volatility in Nigeria. However, asymmetric effect was evident in the market where bad news had more destabilising effect on volatility than good news. Generally, the total impact of bad news on volatility was higher than the impact of good news. The persistence effect of volatility of stock returns is more explosive when asymmetric volatility is considered than under symmetric volatility. In both situations, volatility was persistent, with long period of decay. The significance of α, and β indicates that the exchange news announcements about volatility from the previous periods have an explanatory power on current volatility. In which case, the market is such that old information about exchange news is more important than recent information.

The paper thus concluded that bad news have more destabilizing effect on volatility of stock returns than good news. Hence, it is recommended that investors, risk managers, and investment bankers should explore the shocks in exchange news in pricing financial assets, portfolio diversification, planning, and in forecasting the path of economy growth. The Nigerian stock market should be deepened and diversified to include trading in financial derivative instruments, with a view to boosting investors' confidence which is already weakened as revealed by the longer period it takes volatility persistence to decay. Financial regulators should operate a deep, efficient and uninterrupted information flows' framework – to reduce the effect of information asymmetry on investment decisions, to increase transparency, and boost investors' confidence in the Nigerian stock market.

Furthermore, it is equally recommended that investors should adjust their portfolios to reduce the pervasive effect of exchange rate news announcements on volatility of stock returns in Nigeria.

Future research on this topic could be extended to assess the effect of both macroeconomic news announcements and idiosyncratic news announcements on stock returns and volatility in Nigeria.

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