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Assessing Market Volatility on Daily Stock Returns Using GARCH: Evidence from Nigeria

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Abstract
Adequate knowledge about the volatility, performance and efficiency of stock returns remains vital and essential information to investors. These will guide not only investment decisions but also planning for economic growth and development. Given that the Nigerian Stock Exchange has existed, its ability to generate confidence is still in doubt given the recent crash witnessed in the market. It means the confidence the exchange is expected to instill in investors is still not commensurable. It was against the forgoing that this study examined the impact on stock market returns of volatility in the Nigerian Stock market. The study adopted the ex-post facto research design and data were obtained from daily reports of the Nigerian Stock Exchange from 2nd January, 2001 to 31st December, 2015. The study used the ARCH/GARCH to test the hypothesis stated. The results also revealed that, there is a significant ARCH/GARCH (volatility) effect on stock market returns of the Nigerian Stock market. This is because it was revealed that for stock returns, p-value was less 0.05 and equal to zero showing that the ARCH test statistics exceeds its critical value. Therefore, ARCH/GARCH test strongly rejects the null hypothesis that there is no significant ARCH/GARCH (volatility) effect in given return of all shares index. The study thus concludes that the stock returns contained correlation in its returns or squared returns, which meant that ARCH/GARCH process was found. After testing the dataset, the models were set up and run; the parameters were estimated for each of the model with their conditional volatility. As the conditional volatility is the main ingredient for forecasting volatility and its depended on conditional variance. Then, we check the quality of our estimated parameter and volatility. First test the innovations of each, that there are any kind of correlation is present or not. It was found that there is no significant correlation and ARCH/GARCH effect was present. Therefore, models for single index that are good fitted and better, explained the market variation and volatility observed in the Nigerian Stock Market. The recommendation is that Strategies need to be designed toward reaping abnormal returns by exploiting information and actions that enhance inefficiency in stock markets thus, firms and individuals should be encouraged to buy or sell securities outside their face values, as a means of encouraging business or economic activities in the economy.
Keywords: Volatility; stock market; daily returns; Nigerian Capital Market

1. Introduction

Study Objective

The objective of this study is to examine the impact of volatility on daily stock market returns of the Nigerian Stock Exchange.

Research Question

Based on the objective of this study, the following research question is raised,

1. To what extent does volatility have an impact on stock market returns of the Nigerian stock market?

Research Hypothesis

As a follow-up to the research question raised above the following hypothesis was formulated.

Ho_1: Volatility does not have any significant impact on stock market returns of the Nigerian stock market.

Scope of study

The research covers the period, 2001-2015. Thus this research looked at the effects of volatility on the daily stock market returns of the Nigerian stock market.

Significance of study

Many studies have shown that there is a close connection between economic growth and the level of development of a country's financial system. However, arguments abound as to which of the two affects the other, this is why studies like this continue to be relevant as the debate unfolds. In developing theory of an existing body of knowledge such as studying stock returns, it is fundamental to utilize theories and models that support a link between possible economic parameters and market stock returns. The significance of the study is found in both theory and practice broadly categorized as follows

1. Policy makers of fiscal and monetary policy would find recommendations of this work especially useful in policy formulations given the policy issues that this research would raise.
2. Because of the controversies surrounding the theories of volatility, stock returns and stock market efficiency, endeavors to understand the relationship between volatility and stock market variables have

increased. There has been several numbers of research and working papers. However, this work will significantly contribute to literature regarding Nigeria especially as most studies in this area of finance have been conducted in developed economies.

Organization of Study

The research is organized into six sections. The first section is the study's introduction, section two contains the review of theoretical and empirical literature, section three discusses methodology, section four shows the empirical results of data analyzed, section five is the discussion of findings and summary and the last section is the conclusion and recommendations of the author.

2 Literature review

The literature review is categorized into two main parts; the theoretical aspect and the empirical aspect of previous studies carried out by other scholars.

Theoretical literature

Like other reviews there are other related areas to the study of volatility, and stock market returns not covered by this research, either because they represent open questions on which research so far has been limited, or because covering them would detract from our main focus. Nevertheless, it is important to recognize these issues, both to put the work in its proper perspective and to outline promising areas of future research.

Geert .B and Guojun .W (1997) like most of his counterparts believe that Volatility in equity markets is asymmetric and he also established that conditional volatility and returns are negatively correlated. They attributed asymmetry at the market level to leverage effects and time varying risk premiums. As present and significant as volatility asymmetry is at the market and portfolio levels the source differs across portfolios. A drop in the value of stock (negative return) increases financial leverage, which makes the stock riskier and increases its volatility. French et al (1997) maintained that too many "leverage effects" have become synonymous to asymmetric volatility, the asymmetric nature of the volatility response to return shocks could simply reflect the existence of time-varying risk premiums.

If volatility is priced, an anticipated increase in volatility raises the required return on equity, leading to an immediate stock price decline. The leverage hypothesis claims that return shocks lead to changes in conditional volatility whereas time varying risk premium theory contends that return shocks are caused by changes in conditional volatility. The volatility feedback theory relies first of all on the well-documented fact that volatility is persistent. That is a large realization of news, positive or negative, increases both current and future volatility. The second basic tenet of this theory is that there exists a positive inter-temporal relation between expected return and conditional variance. The increased volatility then raises expected returns and lowers current stock prices, dampening volatility in the case of good news and increasing volatility in the case of bad news. When the conditional covariance between market and stock returns responds more to negative than to positive market shocks the volatility feedback is particularly strong.

Grieb and Reyes (1999) wrote that bad news at the market level has two effects. First, whereas news is evidence of higher current volatility in the market, investors also likely revise the conditional variance since volatility is persistent. This increased conditional volatility at the market level has to be compensated by a higher expected return. And the price decline will not cease until the expected return is sufficiently high hence, a negative return shock may generate a significant increase in conditional volatility. A negative return shock leads to higher leverage at the market level and hence higher stock volatility.

When good news arrives at the market, there are again two effects first, a higher current period market volatility and an upward revision of conditional volatility. When volatility increases, prices decline to induce higher expected returns, offsetting the initial price movement. The volatility feedback effect dampens the original volatility response. Secondly, the resulting market rally(positive return shock) reduces leverage and decreases conditional volatility at the market level. Hence, the net impact on stock return volatility is not clear.

Empirical literature

Several volatility models had been developed based on empirical regularities in trading order flow in the various stock exchanges studied. Components of the model are validated against real data. Many of the models describe endogenous dynamics of volatility such as those employed by Engel R.F and Bollerslev (1986) where fitted parameters of each component of the model using simulation to make predictions about volatility distribution and spread, and comparing the statistical properties of the simulation to the measured statistical properties of volatility and spreads in the data during the same period of time.

Serious interest in the functional form of the distribution of prices began with Mandelbrot's (1963) study of cotton prices, in which he showed that logarithmic price returns are far from normal and suggested that they might be drawn from a levy distribution. Studies by Fama (1965) and Akgiray (1989) indicate that the cumulative distribution of logarithmic price changes has tails that are asymptotically large. It is important because it characterizes the risk of extreme price movements and corresponds to the threshold above which the moments of the distribution become infinite. Having a good characterization of price returns has important

practical consequences for risk control and option pricing.

With increasing power of computers coupled with advances in both nonlinear dynamics and chaos, the volume of research into the re-examination of the behaviour of security returns from the standpoint of market-efficiency has increased considerably, and most of these (see Hsieh, 1991; Willey, 1992;) have cast doubt on the conclusion of market efficiency based only on the lack of serial correlation in returns.

Malkiel (1992) has given the definition of informational efficiency more explicitly, the economic implication of which is that it is impossible to make economic profits by trading on the basis of the given information set. Before the days of nonlinear dynamics, tests for Fama's efficient market hypothesis (EMH) in the context of stock market usually meant testing the null hypothesis that autocorrelation coefficient of different lags are statistically insignificant. For this purpose runs test, Ljung-Box (1978) test of autocorrelation and regression tests used to be normally applied.

But since 1980's it is well appreciated that lack of linear dependence (i.e., serial correlation) does not rule out nonlinear dependence which, if present, would contradict the EMH and may aid in forecasting, especially over short time intervals. Sakai and Tokumaru (1980) have shown that simple nonlinear models exhibit no serial correlation while containing strong nonlinear dependence. This has, in fact, led several researchers like Hinich and Patterson (1985) and Scheikman and LeBaron (1989) to look for nonlinear structures in stock returns. It may be noted in this context that one of the most important and useful tests available in the literature for detecting nonlinear patterns i.e., the existence of potentially forecastable structures, is due to Brock *et al.* (1987, revised 1996), to be henceforth denoted as BDS test.

Bologna (2002) argued that the speculation in the futures market also leads to stabilization of the spot prices. Since futures are characterized by high degree informational efficiency, the effect of the stabilization permits to the spot market. There are several empirical studies that shows that the introduction on index futures trading improves market efficiency and reduced informational asymmetries. Figlewaski (1981) argued that speculation in the futures market is transmitted to the underlying spot markets. The speculation produces a net loss with some speculators gaining (and others loosing), thereby destabilizing the market. Uninformed speculative traders increase price volatility by interjecting noise to a market with limited liquidity. The inflow and existence of the speculators in the futures market produces destabilization forces, which creates undesirable bubbles. Kamara *et al* (1992) suggested that futures market activity increases the spot price variability when futures price is changed by technical factors or manipulations. Sometimes futures market induces a significant amount of hedge trading without attracting enough speculation to permit the effective risk transfer.

Bahmani-Oskooee and Sohrabian (1994) were among the first to use co integration and Granger causality to explain the direction of movement between exchange rates and stock prices and found FIIs using positive feedback trading strategies; Causality may run from stock prices to foreign investment.

Banaji (2000) emphasized on the fact that the capital market reforms like improved market transparency, automation, dematerialization and regulations on reporting and disclosure standards were initiated because of the presence of the FIIs. Mazumdar (2004) found that FII flows have enhanced liquidity in the Indian stock market but not much evidence is there to support the hypothesis that FII flows have generated volatility in the returns.

Panda (2005) examined the impact of FIIs and mutual fund investments on Indian stock market by using Vector Auto regression (VAR) analysis and Granger Causality Test on data of NSE and BSE for the period from Oct. 2003 to Mar. 2004 and found that the returns on Indian stock market indices were more affected by the mutual fund investment than FIIs investment. FIIs are found to follow positive feedback strategy and to have returns chasing tendency. Banerjee and Sarkar (2006) have attempted to model and forecast stock return volatility in the index returns of the NSE, using high frequency intra-day data covering a period from June 2000 through January.

Hau and Helene (2006) believed that returns can be improved for those with long positions when the market booms or reduce the loss associated with a downturn by those whose draw down occurred earlier so leaving a larger precautionary balance. To be able to use a tactical asset allocation strategy an investor must have a good grasp of fundamental value analysis valuation of assets and calculating returns. This way one can allocate more funds to under valued assets and avoid assets that do not provide acceptable margins of safety. Investors that prefer long positions can invest in companies with consistent show of strong fundamentals by buying of their stock when the market is bearish because the price distortions common in short term fluctuations will be corrected over time by then there would have been huge capital gain made.

Much research has been devoted to modeling and forecasting the volatility of financial returns, and yet few theoretical models explain how volatility comes to exist in the first place. Roll (1984) shows that volatility is affected by market microstructure. Glosten and Milgrom (1985) shows that at least one source of volatility can be explained by the liquidity provision process. When market makers infer the possibility of adverse selection, they adjust their trading ranges, which in turn increases the band of price oscillation.

Volatility does not measure the direction of price changes, merely their Dispersion. This is because when calculating standard deviation (or variance), all differences are squared, so that negative and positive

differences are combined into one quantity. Two instruments with different volatilities may have the same expected return, but the instrument with higher volatility will have larger swings in values over a given period of time. For example, a lower volatility stock may have an expected (average) return of 7%, with annual volatility of 5%. This would indicate returns from approximately negative 3% to positive 17% most of the time (19 times out of 20, or 95% via a two standard deviation rule) higher volatility stock, with the same expected return of 7% but with annual volatility of 20%, would indicate returns from approximately negative 33% to positive 47% most of the time (19 times out of 20, or 95%). These estimates assume a normal distribution; in reality stocks are found to be leptokurtic.

Although the Black Scholes equation assumes predictable constant volatility, this is not observed in real markets, and amongst the models are Bruno Dupire's Local Volatility Poisson Process where volatility jumps to new levels with a predictable frequency and the increasingly popular Heston model of Stochastic Volatility. It is common knowledge that types of assets experience periods of high and low volatility. That is, during some periods, prices go up and down quickly, while during other times they barely move at all. Periods when prices fall quickly (a crash) are often followed by prices going down even more, or going up by an unusual amount.

Also, a time when prices rise quickly (a possible bubble) may often be followed by prices going up even more, or going down by an unusual amount. The converse behavior, 'doldrums', can last for a long time as well Most typically, extreme movements do not appear 'out of nowhere'; they are presaged by larger movements than usual. This is termed autoregressive conditional heteroskedasticity. Of course, whether such large movements have the same direction, or the opposite, is more difficult to say. And an increase in volatility does not always presage a further increase—the volatility may simply go back down again. Investors care about volatility for seven reasons:

- The wider the swings in an investment's price, the harder emotionally it is to not worry;
- Price volatility of a trading instrument can define position sizing in a portfolio;
- When certain cash flows from selling a security are needed at a specific future date, higher volatility means a greater chance of a shortfall;
- Higher volatility of returns while saving for retirement results in a wider distribution of possible final portfolio values;
- Higher volatility of return when retired gives withdrawals a larger permanent impact on the portfolio's value;
- Price volatility presents opportunities to buy assets cheaply and sell when overpriced.
- Volatility affects pricing of options, being a parameter of the Black Scholes model.

In today's markets, it is also possible to trade volatility directly, through the use of derivative securities such as options and variance swaps.

Volatility is one of the important aspects of financial market developments providing an important input for portfolio management, option pricing and market regulations (Poon and Granger, 2003). Stock returns volatility differs dramatically across international markets (Xing, 2004; Roll, 1992; Harvey, 1995, Bekaert and Harvey, 1997; and Aggarwal et al. 1999) and have received a great attention from both academicians and practitioners over the last two decades because it can be used as a measure of risk in financial markets. Volatility of stock returns has long been an issue of interest in financial literature. A wide variety of research has been conducted on stock returns volatility in developed and emerging markets since 1970s. Nature of volatility in different markets at different times are discovered, which are indeed of great interest for financial economists. Financial economists are also interested about the causes and variables behind the existence and nature as well as the anomalies relating to market volatility.

In the financial econometrics literature, empirical evidence presented by Donaldson and Kamstra (1997) suggest that stock return volatility is asymmetrically related to past return, with negative unexpected returns. Koutmos (1999) provides evidence that, in agreement with developed markets, stock returns volatility in emerging markets adjust asymmetrically to past information. Studying the Korea and Taiwan stock markets, Titman and Wei (1999) find that Taiwanese stock returns volatility are more correlated with their earnings than Korean returns volatility. The asymmetry argument suggests that the local factors rather than the external factors drive national stock market returns volatility. Harvey (1995) provides evidence that volatility in emerging equity markets is less than in developed equity markets.

Focusing on the forces that determine volatility, Bekaert and Harvey (1997) find in fully integrated markets, volatility is strongly influenced by the local and the world factors while in segmented capital markets, volatility is more likely to be influenced by the local factors. They argue that political risk measured by low credit rating and unstable macroeconomic policies might be translated into high stock market returns volatility. Examining the cause of return volatility in a small and internationally integrated stock market using the Irish equity market, Kearney (1998) finds that the volatility of the exchange rate is a more significant determinant of the Irish equity market return volatility than the global factors. Aggarwal *et al*, (1999) investigate which events causes volatility of emerging stock market returns by examining the global and local events (social, political, and economic) during the period of increased volatility and find that most events tend to be local.

Recently, authors started to look at country-specific risk in addition to the world risk in order to explain the local factors that cause stock market returns volatility. Erb, et al. (1995) find that country risk measures have substantial predictive power for stock market return volatility. In another study by Erb, et al. (1996), country financial risk measured by country credit rating is found sufficient to explain the emerging markets' stock return volatility but insufficient to explain the volatility of returns in developed markets. Cohen et al.'s (1976) observe that differences in return volatility as because of market thinness and share turnover. Emerging Markets are characterized by high risk and return, highly unpredictable and high volatility compared to the developed markets (Bekaert and Harvey, 1997). Diamonte, Liew, and Viskanta (1996) quantify the importance of political risk in predicting volatility in emerging and developed markets. The leading result of this study is that changes in political risk have a more pronounced impact on the emerging markets' return volatility than on developed markets' return volatility.

The empirical evidence of existing studies vary a large extent among the researchers but there is a unanimity among researchers that the issue of stock returns volatility is important. The empirical studies on stock return and volatility has been focused on different angles of risk return relationship and volatility persistence shocks. Batra (2004) investigated Indian stock market from 1979 -2003 and concluded that stock return volatility persistence was increasing on account of financial liberalization process. Persistency is found to be the characteristics of each and every stock market of the world. Floros (2008) found persistence for Egypt and Israel stock markets and concluded that long run component converges slowly. The volatility varies from time to time, and for different frequency, it shows a different pattern, as Caiado (2004) found that the conditional volatility of the stock returns was more persistent in daily series than the low-frequency series. Stock market has characteristic that high volatility periods tend to be persistent. In this study different frequency data are used for investigating this phenomenon of the volatility persistency. Thomas (1995) used GARCH model and estimated strong persistence in variance for daily, weekly and monthly stock returns. In monthly returns, he found seasonality in the volatility and there was one regime shift in the data. Dawood (2007) investigated volatility in the Karachi stock exchange and found that in 1990's market had become more volatile on short as well as medium term basis. He found that the stock market reacted too actively to economic shocks, but this reaction took place on a daily basis and die away within a month.

Several studies such as Haque and Hassan (2000), Harvey (1995a, 1995b), Harvey and Bekaert (1997), Bekaert (1995), Kim and Singal (1999), Choudhury (1996), Lee and Ohk (1991), and Classens et al. (1995) reveal the evidence of market volatility in the emerging stock markets. The financial literature that offers research on stock market volatility over time and linkages that exist among world markets is still unresolved. Theoretical works by (Whitelaw, 2000, Bekaert and Wu, 2000; and Wu, 2001) consistently assert that stock market volatility should be negatively correlated with stock returns. Earlier study of French et al. (1987) found a positive and significant relationship. However, studies such as Baillie and DeGennaro (1990); Theodossiou and Lee (1995) reported a positive but insignificant relationship between stock market volatility and stock returns. Consistent with the asymmetric volatility argument, researches recently report negative and often significant relationship between the volatility and return (Nelson, 1991, Glosten et al., 1993, Bekaert and Wu, 2000, Wu, 2001; Brandt and Kang, 2003).

It has been empirically demonstrated that the relationship between return and volatility depends on the specification of the conditional volatility. In particular, using a parametric GARCH-M model, Li (2002) finds that a positive but statistically insignificant relationship exists. In contrast, using a flexible semi-parametric GARCH-M model, the study document that a negative relationship prevails instead. While the volatility for the stock market as a whole has been remarkably stable over time, the volatility of individual stocks appears to have increased. Li (2002) examined the relationship between expected stock returns and volatility in the twelve largest international stock markets. Consistent with the most previous studies, they found the estimated relationship between return and volatility sensitive to the way volatilities are examined. However, Batra (2004) examined the time variation in volatility in the Indian stock market. He used the asymmetric GARCH methodology augmented by structural changes. Batra identifies sudden shifts in the stock price volatility and nature of events that cause these shifts in volatility.

Selcuk (2004) investigated volatility in emerging stock markets and found volatility persistency and high volatility in the developing markets. GARCH parameters are able to explain the level of persistency in the volatility. Magnus and Fosu (2006) found the parameter estimates of GARCH models close to unity and suggested a high level of persistence in the Ghana stock exchange.

Non linear models are considered to be the dominant models than the linear class of models. Rashid and Ahmad (2008) investigated a class of models and found that the nonlinear GARCH models dominate the other class of models in predicting stock market volatility in Pakistan. Ali and Akbar (2007) used data from 1991 to 2006 and applied one Factor ANOVA and found that weekly and monthly effects did not show inefficiency in stock returns of Pakistani equity market, however, the market is inefficient in the short run (daily effects).

Persistency in volatility is normally due to the inefficiency in the market. Market is said to be volatile

past prices reflect in the future prices. Rizwan and Khan (2007) studied the volatility of the Pakistani stock market and found persistence, which signified inefficiency in the stock market. They found that lagged returns in the GARCH model were significant in explaining current returns. Amir and Kashif-Ur-Rehman (2011) compare the variance structure of high (daily) and low (weekly, monthly) frequencies of data of the Pakistani stock market. By employing ARCH (1) and GARCH (1, 1) models, the study found that statistical properties of the three data series of returns were substantially different from one another. The presence of persistency was more in the daily stock returns as compared to other data sets, which showed that the volatility models were sensitive to the frequencies of data series.

In Nigeria, studies on modelling volatility of stock returns provide different perspectives. Jayasuriya (2002) use asymmetric GARCH methodology to examine the effect of stock market liberalization on stock returns volatility of fifteen emerging markets, including Nigeria, for the period December 1984 to March 2000. The study reports, among others, that positive (negative) change in prices have been followed by negative (positive) changes indicating a cyclical type behavior in stock price changes rather than volatility clustering in Nigeria. Ogum, et al., (2005) investigate the emerging market volatility using Nigeria and Kenya stock return series. Their results of the exponential GARCH model indicate that asymmetric volatility found in the U.S. and other developed markets is also present in Nigerian, but Kenya shows evidence of significant and positive asymmetric volatility, suggesting that positive shocks increase volatility more than negative shocks of an equal magnitude.

Olowe (2009) investigated the relation between stock returns and volatility in Nigeria using E-GARCH-in-mean model in the light of banking reforms, insurance reform, stock market crash and the global financial crisis. His findings found little evidence on the relationship between stock returns and risk as measured by its own volatility and show that banking reform and stock market crash negatively impacts on stock return while insurance reform and the global financial crisis have no impact on stock return.

More recently, Emenike (2010) uses Monthly All Share Indices to investigate volatility persistence, asymmetric properties of the series and leverage effects in Nigeria. The results of GARCH (1,1) model indicate evidence of volatility clustering in the NSE return series. Also, the results of the GJRGARCH (1,1) model show the existence of leverage effects in the series. Overall results from this study provide evidence to show volatility persistence, fat-tail distribution, and leverage effects for the Nigeria stock returns data.

However, in finance literature price changes represent random departure from previous and are known as random walk. Random walk is associated with efficient market hypothesis EMH and follow were information is unimpeded and information is immediately reflected in stock prices, then tomorrow's price change will reflect only tomorrow's news and will be independent of the price changes today (Burton, 2003). But news is by definition unpredictable and, thus, resulting price changes must be unpredictable and random.

Persistency is related to the jumps, which changes the volatility pattern for a reasonable time period. Long memory and persistence is related with the longer movement in the returns series. A significant impact of volatility on the stock prices can only take place if shocks to volatility persist over a long time (Poterba and Summers, 1986). As Maheuy and McCurdyz (2003) modelled the jump dynamics and volatility components, he concluded that no jump takes a significant period of time to return to normal level. The persistency in volatility is due to different reasons and it varies from country to country and time to time. There are little empirical evidences available for Nigerian market regarding volatility characteristic. This study fills this gap by capturing this important phenomenon of stock returns volatility and ascertain whether Nigerian capital market is relevant.

This study attempts to investigate the insight into the risk return relationship, predictability, and volatility persistence shocks in Nigeria using daily data which might be helpful for risk management through portfolio management.

3. Methodology

Research Design

This research adopts the *ex-post facto* research design. In the context of social and educational research the phrase 'after the fact' or 'retrospectively' refers to those studies which investigate possible cause-and-effect relationships by observing an existing condition or state of affairs and searching back in time for plausible causal factors. In effect, researchers ask themselves what factors seem to be associated with certain occurrences, or conditions, or aspects of behavior. Kim and Singal (1993) has defined *ex-post facto* research more formally as that in which the independent variable or variables have already occurred and in which the researcher starts with the observation of a dependent variable or variables. While Onwumere (2005) posits that the *ex-post facto* research design establishes a causal link between them. From the forgoing, therefore, this research adopted the *ex-post facto* research design.

Nature and Sources of Data

Secondary data is data which has been collected by individuals or agencies for purposes other than those of our particular research study (Onwumere, 2005). The justification for the use of secondary data in this research is

that; it is available and is entirely appropriate and wholly adequate to draw conclusions and answer the question or solve the problem; it is far cheaper to collect; the time involved in searching secondary sources is much less than that needed to complete primary data collection; secondary sources of information can yield more accurate data than that obtained through primary research; secondary data can play a substantial role in the exploratory phase of the research when the task at hand is to define the research problem and to generate hypotheses; and it will help define the population. Thus, the data used for this research was generated from the NSE official daily report from January 2001 to December 2015.

Variables

The variables used in the models are the Dependent and Independent, the former represents the output or effects while the latter represents the inputs or causes. And since the models are statistical the dependent variable is studied to see if and how much it varies as the independent variable varies.

Dependent Variable – Stock Return (SR)

This study adopted the daily All Shares Index (ASI) of the Nigerian Stock Market (NSE) as a measure of stock market returns in line with the works of Arumugam (1997), Berument and Kiymaz (2001) and Rahman (2009). The NSE all shares index is a composite index calculated from prices of all common stocks traded on the NSE. Specifically, the Index is a market capitalization weighted price index which compares the current market value of all listed common shares to the value on the base date of 2nd January 2001 when the first session was traded on the market. The NSE-Index was primarily set at 100 points. The data was obtained over the period from 2nd January 2001 to December 31st 2015.

Independent Variables

Market Capitalization Value Ratio

Market Capitalization Value ratio measures attempts to differentiate between price movement due to the degree of liquidity from other factors such as general market conditions or arrival of new information to measure both elements of resilience and speed of price recovery. This measure uses the residuals of a regression of the asset's return on the return of the market thus purging it from its systemic risk to determine the intrinsic liquidity of the assets. This is in line with Sarr and Lybek (2002) and was measured by value of shares traded divided by market capitalization multiplied by 100.

Value of Transactions Ratio

The total volume of shares traded measures the organized trading of firm equity and therefore should positively reflect liquidity on an economy-wide basis. The value transaction ratio is used in conjunction with market capitalization although a market may be large, there may be little trading. Again, the interest in this research is on the impact of liquidity and volatility on stock market returns of the Nigerian Stock Exchange therefore this study adopted this measure in line with the works of Guha Deb and Mukherjee (2008). The formula computed by volume of transaction by market capitalization multiplied by 100.

Turnover Ratio

The turnover ratio complements the market capitalization ratio. A large but inactive market will have a large market capitalization ratio but a small turnover ratio. This is why market capitalization ratio is suited for measuring the size of the market.Turnover ratio also complements the total value traded ratio. While the total value traded ratio captures trading relative to the size of the economy, turnover measures trading relative to the size of the stock market. A small liquid market will have a high turnover ratio but a small total value traded ratio. This proxy is adopted in line with the works of Chaudhury (1991), Goswami and Anshuman (2000), Lumsdaine and Ng (1999) and Woolridge (1991).

Model Justification

Thus the model for this research is based on the findings and views expressed in the studies of scholars like Engle. Engel (1982) argues that an adequate volatility model is the one that sufficiently models heteroscadasticity in the disturbance term and also captures the stylized fact inherent in stock return series such as volatility clustering, Autoregressive Conditional Heteroscadasticity (ARCH) effect and asymmetry. The famous volatility models used in most studies include Autoregressive Conditional Heteroscadasticity and its extensions, such as Generalized ARCH, Threshold GARCH, Exponential GARCH and Power GARCH. In Most cases, first-order GARCH models have extensively been proven to be adequate for modeling and forecasting financial time series (see Bera and Higgins (1993), Hsieh (1991) Olowe (2011), Hojatallah and Ramanarayanan (2011), Eric (2008) and Hansen and Lunda (2004). However, little or no emphasis has been given to appropriate error distribution assumptions for modeling.

Many researchers have questioned the use of GARCH to forecast volatilities if residuals are correlated. The answers many have given suggest that if the sequence of residuals from the forecast are not properly independent, then the model is missing something and further changes should be made to remove the correlation. That does make sense to me and it suggests that we should be able to do better than a simple GARCH(1,1) model. However, in almost all the literature on the subject, this issue is never discussed, and the fact that forecasts produced residuals that are serially correlated is taken as a fact of life. Indeed, people have produced

methods for accounting for both serial and contemporaneous correlations when comparing different forecast models. So, why is this the case? If the GARCH(1,1) model does have such problems, why is it still considered a standard approach for modeling volatility?

It is obvious from the works of these scholars that, the capital market has an impact on economic growth; however, there is a gap in literature on the effect of volatility on daily stock market returns. This is the objective which this research work will be based. Thus, the lacuna which this research filled is a study which contributed to literature on the effect of volatility on daily stock market returns in the Nigerian Stock market.

4. RESULTS AND DISCUSSIONS

Techniques of Analysis

Also, for this study we employed ARCH/GARCH Model to test the presence of volatility of stock returns. Many time series variables, particularly asset prices, seem to exhibit random walk behavior. For this reason, it is hard to predict how they will change in the future. However, such variables often do exhibit predictable patterns of volatility. Thus, the square of the change in an asset price is a measure of its volatility. Standard time series methods can be used to model the patterns of volatility in asset prices. The only difference is that volatility of the asset price is used as the dependent variable. The ARCH models are a more formal way of measuring volatility. They contain two equations. One is a standard regression equation. The second is a volatility equation, where volatility is defined as being the (time varying) variance of the regression error. Again, the ARCH models share similarities with AR models, except that the "AR" part relates to the volatility equation. ARCH and GARCH models are estimated using STATA software in this study.

4.1 Test of Hypothesis

Step One: Restatement of the Hypothesis in Null and Alternate forms:

Ho_2: There is no significant volatility on stock returns in the Nigerian stock market

Ha_2: There is significant volatility on stock returns in the Nigerian stock market

Step Two: Presentation and Analysis of Result

Table 4.1 Regression Result for the Hypothesis

ARCH family regression

Sample: 04jan1999 – 31dec2013, but with gaps — Number of obs = 3712
Distribution: Gaussian — Wald chi2(3) = 1.48e+06
Log likelihood = 4211.202 — Prob > chi2 = 0.0000

LogASI	Coef.	OPG Std. Err.	z	P>|z|	[95% Conf.	Interval]
LogASI						
LogMcap	.3909509	.0010489	372.74	0.000	.3888952	.3930066
LogVol	-.005689	.0008166	-6.97	0.000	-.0072896	-.0040884
TO r	.0073159	.0011154	6.56	0.000	.0051297	.0095021
_cons	-.5923855	.0068414	-86.59	0.000	-.6057943	-.5789767
ARCH						
arch						
L1.	1.005957	.0583024	17.25	0.000	.8916864	1.120228
garch						
L1.	.0001679	.0001103	1.52	0.128	-.0000482	.000384
_cons	2.31e-06	8.72e-07	2.65	0.008	6.01e-07	4.02e-06

Durbin-Watson statistic (original) 2.095888
Durbin-Watson statistic (transformed) 2.037809

Source: Researcher's Stata Result

Log ASI = -.59 + 0.39LogMCap – 0.01LogVol + 0.01TOR + μ

From the table 4.1 above, since the P-values are all less than .05, we concluded all the variables are

statistically significant at the 5% level. It was revealed from the table that prob > chi^2 is greater that wald Chi^2 indicating the presence of significant ARCH effects. In Mcap, Vol and Tr specifications, the mean equations indicate that lagged daily returns of both stocks are not significant determinants of current returns, as is implied by efficient markets theory. There are very significant GARCH effects in the specifications. A sizable correlation parameter appears, as it did in the Mcap specification. The magnitudes of the lambda parameters indicate that the evolution of the conditional covariances depends more on their past values than on lagged residuals' innovations. The Durbin Watson statistic is 2.09 which indicate that there is no trace of spatial and serial autocorrelation.

Step Three: Decision

From the above output for ASI index, p-value is zero which is less 0.05 shows that the ARCH test statistics exceeds its critical value. Therefore, ARCH test strongly rejects the null hypothesis that there is no significant ARCH/GARCH (volatility) effect in given return of ASI. Thus, the alternative hypothesis is accepted showing that there is a significant ARCH/GARCH (volatility) effect on stock returns in the Nigerian Stock market.

Implication of Results

The implication of the results of this study was examined in line with the stated objective of the hypothesis tested.

Objective: To determine the impact of volatility on stock returns of the Nigerian Stock market.

Stock market volatility indicates the degree of price variation between the share prices during a particular period. A certain degree of market volatility is unavoidable, even desirable, as the stock price fluctuation indicates changing values across economic activities and it facilitates better resource allocation. But frequent and wide stock market variations cause uncertainty about the value of an asset and affect the confidence of the investor. The risk averse and the risk neutral investors may withdraw from a market at sharp price movements. Extreme volatility disrupts the smooth functioning of the stock market. The literature on stock market volatility is voluminous, but, some general conclusions on common stock risk have emerged from this research. The overall stock market volatility has fluctuated over the time with no discernible trend and some authors have argued that volatility is higher during the bear markets.

For market performance, the stability of stock returns ought to be a major concern. This of course is linked to the efficiency of the market. A review of studies indicates that while some studies indicate that stock markets are efficient but sometimes unpredictable, others reject the random walk hypothesis, insisting that the markets are volatile, inefficient and predictable. Lo (1991) in Nyong (2005) emphasizes the difficulties of assessing market efficiency and proposed ideally that stock market efficiency should be tested in the context of equilibrium asset pricing model that defines normal asset returns. The general consensus is that if stock markets are inefficient, it means profitable opportunities exist to reap above normal returns and vice versa.

Different approaches have been adopted to investigate the efficiency and volatility of stock returns in different markets however, there is the general consensus that the appropriate approach to examine the efficient and the volatility of stock returns is the Autoregressive Conditional Heteroskedasticity (ARCH) developed by Engel (1982). The ARCH approach and its various modifications have been shown to provide a good fit to many financial return time series. This was used to test hypothesis four of this study. This is because changes in the variability of returns over time are expected to impact on the risk or profit of an investment (Nyong, 2005). It was found that there was significant volatility of stock return in the Nigerian Stock market. This is in line with other works in this area of finance (Nyong, 2005).

5 DISCUSSIONS OF FINDINGS AND CONCLUSIONS

Findings

1. From the hypothesis tested, it was revealed that for stock returns, p-value was less 0.05 and equal to zero showing that the ARCH test statistics exceeds its critical value. Therefore, ARCH/GARCH test strongly rejects the null hypothesis that there is no significant ARCH/GARCH (volatility) effect in given return of all shares index. Thus, there is a significant ARCH/GARCH (volatility) effect on stock return of the Nigerian Stock market.

Conclusions

Also, the stock returns contained correlation in its returns or squared returns, which meant that ARCH/GARCH process was found. After testing the dataset, the models were set up and run; the parameters were estimated for each of the model with their conditional volatility. As the conditional volatility is the main ingredient for forecasting volatility and its depended on conditional variance. Then, we check the quality of our estimated parameter and volatility. First test the innovations of each, that there are any kind of correlation is present or not. We found that there is no significant correlation and ARCH/GARCH effect was present. Therefore, models for single index that are good fitted and better, explained the market variation and volatility observed in the Nigerian Stock Market.

It is no longer prophetic to state that volatility will always remain present in the Nigerian capital market because it had never really been absent and it is expected to remain in the market indefinitely. There are many factors that can cause market volatility which include but not limited to share index movements above or below

normal average, investor confidence, direct (or implied) government regulation, uncertainty and market bubble boom or burst. The question academic research is to answer is; how do we deal with it?

6.0 RECOMMENDATIONS

Due to large volatility in some of the markets, investors in these markets are likely to be worse-off. Therefore, it is recommended that under such conditions, expected returns must be raised. Strategies need to be designed toward reaping abnormal returns by exploiting information and actions that enhance inefficiency in stock markets thus, firms and individuals should be encouraged to buy or sell securities outside their face values, as a means of encouraging business or economic activities in the economy.

In the light of the Nigerian government's plan to implement derivative trading fully by the year 2017 it is also an academic imperative to suggest for further studies that Further attempts can be made to study the cross-sectional variation of stock liquidity and trading activity given the vulnerability of investors to unexpected market shocks.

Two main bodies of theories exist in the literature about the relationship between derivatives market and the underlying spot market. The theoretical literature proposes both a 'destabilizing force' hypothesis that predicts increased volatility and a 'market completion' hypothesis in which decreased volatility is predicted. Because many of the theories propounded had contradictory conclusions it would be good if further research is made by scholars in future.

Researchers can undertake empirical investigation so as to universalize the impact of equity derivatives on the underlying volatility since market information and efficiency of derivative trading have the potential to stabilize or destabilize the underlying market

New theories should be developed by further studies on the "size effect" of market returns on volume and price. Currently theoretical explanations in literature for size effect do not sufficiently explain the gaps in previous research even though there is a general agreement about the importance of size.

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