

FUNDAMENTAL VARIABLES INFLUENCE ON STOCK MARKET RETURNS VOLATILITY IN NIGERIA

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Abstract

This study examines fundamental variables influence on stock market prices using a first-order univariate EGARCH term and a first-order ARCH term (EGARCH [1, 1]). The Granger-causality test was also used to further investigate the direction of causation between stock price volatility and the independent variables adopted in the study. The empirical result revealed that there exist a weak positive relationship between inflation, financial openness and stock market volatility; and a negative relationship between exchange rate and stock market volatility. The results further revealed that rising foreign financial participation do not seem to expose the Nigerian stock market more to vagaries; neither do they convey easy amplification of short term disequilibrium that may come up in the capital market. Furthermore, the results were not statistically significant enough to prove a strong fundamental Variable influence on stock market volatility in Nigeria. Overall, the empirical findings generally support the view that Nigerian stock market domestic volatility is weakly influenced by local idiosyncratic shocks which indicates the proportion of volatility generated within the markets due to changes in broad macroeconomic variables that are not attributable to external global factors. Therefore, the study recommends that the potential for gains from international portfolio diversification and the scope for success of capital market master plans and policies aimed at the stabilization of the stock market in Nigeria exist. In addition, the government and indeed statutory capital market regulators are advised to further open up the Nigerian financial market and economy to more capital inflows needed for further economic and industrial development. Investors are also advised to hedge against stock market volatility by instructing very highly diversified portfolio's which reflects the overall market portfolio.

Keyword: *Disequilibrium, volatility, variables, inflation, portfolio.*

Introduction

A common problem plaguing the growth of developing countries like Nigeria is the shallow nature of its financial markets both in terms of breadth and depth. Indeed financial markets play an important role in the process of economic growth and development by facilitating savings and channelling funds from savers to investors. While there have been numerous attempts to develop the financial sector, emerging markets like that of Nigeria are also facing the problem of volatility in numerous fronts – arising from fluctuations in fundamental variables like inflation, exchange rate and changing levels of financial openness – including volatility of its financial sector.

Volatility may impair the smooth functioning of the financial system and adversely affect economic performance. Similarly, stock market volatility also has a number of negative implications. One of the ways in which it affects the economy is through its effect on consumer spending (Campbell, 1996; Starr-McCluer, 1998; Ludvigson & Steindel, 1999; Poterba, 2000). The impact of stock market volatility on consumer spending is related via the wealth effect. Increased wealth will drive up consumer spending. However, a fall in stock market prices and indices will weaken consumer confidence and thus drive down

consumer spending. Stock market volatility may also affect business investment (Zulia, 1995) and economic growth directly (Levine & Zervos 1996; Rajni & Mehendra, 2007). A rise in stock market volatility in many financial markets could possibly be interpreted as a rise in the risk of equity investment arising from volatilities in some fundamental economic variables. This could lead to a shift of invertible funds to less risky assets and a rise in the cost of funds to firms desirous of raising funds for future expansion, from the bourse (stock exchange).

While there is a general consensus on what constitutes stock market volatility and, to a lesser extent, on how to measure it; there is far less agreement on the causes of changes in stock market volatility. Some economists see the causes of volatility as emanating from the arrival of new unanticipated information that alters expected returns on a stock. Thus, changes in market volatility would merely reflect changes in the local or global economic environment. Others claim that volatility is mainly caused by changes in changes in trading volume, practices or patterns, which in turn are driven by factors such as changes in fundamental policies, shifts in investor tolerance of risk and increased uncertainty arising from changing levels of inflation, financial openness and exchange rates (Idolor, 2014; Rajni The & Mehendra, 2007).

The degree of stock market return and volatility if known can help forecasters predict the path of an economy's growth and the structure of volatility can imply that investors now need to hold more stocks in their portfolio to achieve diversification. This case is more serious for a relatively small (compared to developed economies) and emerging economy like Nigeria which is currently attempting to further deepen her financial sector by developing her securities market. Unlike mature stock markets of advanced economies, the stock markets of less developed economies like Nigeria began to develop rapidly only in the last two decades, and are sensitive to factors such as changes in levels of economic activities, changes in the political and economic environment as well as changes in general fundamental variables (Eriki & Idolor, 2010).

Many attempts have been made in the past to determine and measure stock market volatility arising from changes in the level of inflation, financial openness, and exchange rate in emerging fundamental. Analysts have used Markovian and Monte Carlo approaches and more tools are being evolved in the literature to deal with this aspect of the stock market. All the attempts are to see if an investor can determine the risk inherent in the market and hence reap a windfall through efficient portfolio creation and diversification. The success of such analytical tool would naturally lead to an upward trend in the stock market and further lead to market vibrancy and economic development by facilitating informed investment and divestment decisions.

Objectives of the Study

The aim of the study is to ascertain the effects of fluctuations of some broad fundamental variables of Nigeria's stock market volatility. In specific terms, the research objectives are to:

- i. Determine if changes in the level of inflation significantly lead to volatility in stock market prices/returns,
- ii. Ascertain if changes in the level of financial openness significantly lead to volatility in stock market prices/returns,
- iii. Determine whether exchange rate fluctuations significantly lead to stock market volatility.

Research Hypotheses

As a frame of reference, the following hypotheses stated in the null form are posed:

H₀₁: Changes in the level of inflation do not significantly lead to stock prices in Nigerian.

Ho2: Changes in the level of financial openness do not significantly lead to stock market volatility in Nigeria.

Ho3: fluctuations in the level of exchange rate do not significantly lead to stock market volatility in Nigeria.

Related literature

Conceptual Framework

This section provides the conceptual framework. Specifically it presents the various conflicting definition of the concepts as well as some related studies in this very exciting aspect of the financial markets literature.

Volatility

Volatility has been defined in various ways by different scholars in the field; right from its formal empirical investigations with the seminal work of Grubel (1968), and later in the 1970s and 1980s by Levy and Sarnat (1970), Ripley (1973), Solnik (1974), Errunza (1977), Hilliard (1979), Engle (1982) and Bollerslev (1986). The reason usually given for the varied definition of the concept is that it is too wide in scope for a consensus definition. The former and latter studies however have implicated volatility arising from fluctuations in some broad macroeconomic variables like inflation, financial openness and exchange rates in many of the numerous stock market crashes and value meltdown which the world has experienced in recent years (Todorov 2012; Mabvuto, 2011). Volatility is a measure of the dispersion of returns for a given security or stock market index. It is a measure of the gyrations, fluctuation or wide swings of security prices or market index over time (Ikponmwosa, 2013). Volatility can also be defined as a measure of risk based on the standard deviation of an asset return. It is a variable that appears in option pricing formulas, where it denotes the volatility of the underlying asset return from now to the expiration of the option (Campbell, 2004). Volatility is a great concern for investors, or for anyone dealing with financial assets.

Investors like to know how much volatility, or risk, they are exposed to. Which is why they are often interested in estimating the volatility for stocks, knowing that volatility helps give them a feel of the possible range of values that a stock return will attain over time (Bollerslev, 1986). When an investor knows how much volatility he is exposed to he can make informed decisions on his investments (Chris, 2002).

Volatility is also a term which indicates, how much and how quickly the value of an investment or market sector changes. The volatility of a stock relative to the overall market is known as a stock's beta, and the volatility which is triggered by internal factors, regardless of the market is known as a stock's alpha (Chris, 2002). In other words, volatility is a statistical measure of the dispersion of returns for a particular security or market index. It is also a statistical measure of the scale of fluctuations in the price of a share, a commodity or a stock market index in the recent past, and, it is generally taken to be a good measure for the relative riskiness of an asset (Ikponmwosa, 2013). According to Mordi (2006), stock market volatility refers to the swings or fluctuations in stock market prices over a period of time or deviations from a benchmark or equilibrium stock price level.

Measurement of Volatility

Volatility was traditionally measured in the past by simply using the standard deviation or variance between returns from that same security or stock market index (Ikponmwosa, 2013). However, the above measures have been found to be inadequate when dealing with time series data, due to their inability to capture volatility clustering, transmission, spill-over and contagion among financial markets and assets

(Todorov, 2012). Consequently, researchers today rely more on the use of the Autoregressive Conditional Heteroskedasticity (ARCH) model developed by Engle (1982) and its extension, the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) proposed by Bollerslev (1986).

Volatility being a measure of a security's stability can also be calculated as the deviation from a certain continuously compounded return over a given period of time. It is an important ortant measure of quantifying risk, for example, a security with a volatility of 50% is considered to be of very high risk because it has the potential to increase or decrease up to half its value. Volatility may also influence the type of investment one makes; however, highly volatile securities lend themselves more toward short selling and other forms of hedging techniques adopted by speculators in their attempts at beating the stock market (Campbell, 2004).

Effects of Volatility

Volatility may impair the smooth functioning of the financial system and adversely affect economic performance (Mala & Reddy, 2007; Bob-Osaze, 2011). High levels of volatility can adversely affect stock markets and undermine the financial system as a whole. Volatility also discourages risk adverse investors and savers from investing, and stock market fluctuations may raise the cost of capital to corporations. Volatility also tends to discourage firms from seeking a stock market listing or attempting to raise funds through new issues. Also, high levels of stock market volatility can impede investment and slow down overall economic growth (DeLong et al, 1989). Similarly, stock market volatility also has a number of negative implications which can adversely affect equity prices. For instance, a rise in stock market volatility can be interpreted as a rise in risk of equity investment and thus shift of funds to less risky assets. This move could lead to a rise in cost of funds to firms while small and start-up firms might bear this effect as investor's tum to the purchase of the equities of larger, well known and established firms (Mala & Reddy, 2007).

While there is a general consensus on what constitutes stock market volatility, and, to a lesser extent, on how to measure it, there is far less agreement on the causes of changes in stock market volatility (Mala & Reddy, 2007). Some economists see the causes of volatility as emanating from the arrival of new, unanticipated information that alters expected returns on a stock (Engle & Ng, 1993). In this instance, changes in stock market volatility would merely reflect changes in the world or global economic environment. Others claim that volatility is caused mainly by changes in trading volume, practices or patterns, which in turn are driven by factors such as modifications in fundamental policies, shifts in investor's tolerance of risk and increased uncertainty (Ikponmwosa, 2013).

Significance of Volatility

Knowledge of volatility is of crucial importance in many areas of finance. For example, considerable macroeconomic work has been done in studying the variability of inflation over time. For some decision makers, inflation in itself may not be bad, but its variability is bad because it makes financial planning difficult. The same is true for importers, exporters, and traders in foreign exchange markets, for variability in interest and exchange rates could mean huge losses or profits (DeLong et al, 1989). Investors in stock market worldwide are obviously interested in the volatility of stock returns in countries with high or low level of financial openness, because high volatility could mean huge losses or gains and hence greater uncertainty. Also, in highly volatile markets, it is usually difficult for companies to raise capital in the capital markets (Gujarati, 2005).

Financial Openness

Financial openness refers to the deregulation of domestic financial market and the liberalization of the capital account. In this light financial openness encourages foreign ownership of equity and

encouragement of international capital flows (Huang, 2006). Many studies have been made to highlight the impact of financial openness on the financial sector and overall economic performance in emerging economies (Lenuta 2012). Many of such, studies - for instance - have shown that financial openness or liberalization contribute on the one hand, to strengthen the functioning of financial systems, to improve the competitiveness of the banking and financial sector, and to transform savings into funds available for financing the economy. On the other hand, it helps to promote international diversification and access to global capital market. For example, Kim and Singal (2000) argue that the abandonment of controls on financial sector leads to more efficient capital market in emerging economies, allows the guidance of existing funds and national economies to most productive investments. Levine and Zervos (1998), Stulz (1999) and Mishkin (2001) argue that liberalization will improve transparency and reduce liquidity problems in emerging countries. Other researchers, such as Bekaert and Harvey (2000) and Henry (2000), argue that participants in emerging markets can enjoy new gains from international diversification and reduce capital costs, after market liberalization. However Bekaert, Havery and Lundblad (2001) and Lenuta (2012), argue that economic growth tends to be improved as a result of financial deregulation.

Exchange Rate

In the field of finance, exchange rate also known as the foreign exchange rate between two countries specifies how much one currency is worth in terms of another. In other words, it is the value of a foreign nation's currency in terms of the home nation (Sullivan & Steven, 2003). Theory explains that a change in the exchange rate would affect a firm's operation and overall profits which would in turn affect its stock prices, depending on the multinational characteristics of the firm. Conversely, a downward movement of the stock market will motivate investors to seek for better returns elsewhere. This decreases the demand for money, pushing interest down, causing further outflow of funds and hence depreciating the currency.

Furthermore, to explain the interaction between stock market volatility and exchange rate movement, two portfolio models have been proposed. Firstly, the flow model explains the impact of exchange rate movement on the international competitiveness of the firm as well as the balance of trade position (Choi, et al 2008). Share price movement on the wealth, liquidity effects and indirectly the exchange rate. Specifically, a reduction in stock prices reduces interest rate which in turn induces capital outflows and in turn causes currency depreciation.

The second is the “stock-oriented” model where the stock market – exchange rate link is explained through a country's account. In this model, the exchange rate equates demand and supply for assets (bonds and stocks). Therefore, expectations of relative currency movement have a significant impact on price movement of financially held assets. With this, stock price movement may be influenced by exchange rate movements. That is, if the Nigerian naira for example depreciates against a foreign currency (the U.S dollar), it will increase returns on foreign currency. Such events will motivate investors to move funds from domestic assets (stocks) towards dollar assets that consequently reduce stock prices. This in turn makes a depreciating currency to have a negative impact on stock market returns (Adjasi & Biekpe, 2005).

Inflation

Inflation is a general rise in price level. It happens when you need more money to buy the same items very recently sold at lower prices. The linkage between stock market and inflation if any has drawn the attention of researchers and practitioners alike, particularly since the twentieth century. According to the generalized Fisher (1930) hypothesis, equity stocks represent claims against real assets of a business, and as such, may serve as a hedge against inflation. If this holds, then investors can sell their financial assets when expected inflation is pronounced. In such a situation, stock prices in nominal terms should fully reflect expected inflation and the relationship between these two variables should be positively correlated *ex ante* (Loannides, et al, 2005). This argument of the stock market serving as a hedge against inflation

may also imply that investors are fully compensated for the rise in the general price level through corresponding increases in nominal stock market returns and thus, real returns remains unaltered.

Inflation can be divide into expected inflation and unexpected inflation. Expected inflation rate is as a result of economist and consumer plan year to year. If inflation is expected, people are less likely to hold cash, overtime the money loses value due to inflation. While the unexpected inflation is beyond what was expected by economist and consumers. In general, the effects of unexpected inflation are much more harmful than the effects of the expected inflation.

Theoretical Review

There are two (2) major classes of theories of asses pricing namely; the consumption Based Asset Pricing Model (CB-APM) and the Factor Asset Pricing Model (F-APM).

Consumption Based Asset Pricing Theory

The most basic pricing expression emanates from the marginal utility loss or gain of consuming less today to increase precautionary savings vis-a-vis investment in form of buying more of asset or consuming more today and reduce investment in asset. The fundamental point of this theory is that the marginal utility loss today must equal the marginal utility gain tomorrow; this suggests that asset price must equal the expected discounted value of its payoffs. The Consumption Based Theory proclaims that the marginal utility and not consumption is the rudimentary measure of investment and by extension asset prices. Consumption is low and marginal utility is high when the investor’s other assets have performed poorly, precautionary savings on the other hand, increases while the trade-off of consumption between current and future periods is expected to rise noticeable (Cochrane, 2005). To this end, assuming an additive utility function for an investor is expressed as follows:

$$U(C_t, C_{t+i}) = U(C_t) + \varnothing E_t(U(C_{t+i})) \dots\dots\dots(2.1)$$

Where the left Band expression stands for the total consumption utility function of an investor while the right land terms form the addition of both current and future consumption functions; the future consumption term is random, this is subject to the fact that the expectation term, E_t is attached to the future utility function and \varnothing measures the subjective discount rate or the investor's risk tolerance. C_t depicts consumption at current period. Investors prefer a consumption stream that is stable overtime and across investment states of nature, such that equation one (2.1) can be generalized in the following form:

Note $k = 1, 2 \dots K$

$$\sum_{k=1}^k U(C_t, C_{t+i}) = \sum_{k=1}^k U(C_t) + \varnothing E_t(U(C_{t+i})) \dots\dots\dots(2.2)$$

The Factor-Asset Pricing Theory

The just discussed consumption based model provides some succinct answers to most asset pricing questions. Theoretically, however, in practice it does not work well. This aggravates the quest for data applicable asset pricing model. In an attempt to address this issue, the linear factor models have been presented and embraced by most empirical work on discrete time model in finance. The linear factor pricing models replace the consumption based model of the marginal utility approach to model asset price with a linear factor model. The factor pricing model comprises of several linear factor models. This study selects related theories under the factor model. In this case the study list these theories as follows: the Capital Asset Pricing Theory (CAPT), Tama-French (1992) Three Factor Model and the Arbitrage Pricing Theory (Ross 1976), the Stochastic Discount Factor (SDF) Asset Pricing Model (Cochrane, 2005),

Behavioural Asset Pricing Model (Baker & Wurgler, 2007) and the Behavioural SDF-Based Asset Pricing Model (Shefrin & Belotti, 2007).

The Two Pass Procedure Theory

The two pass procedure theory (rolling regression) was developed by Fama and Macbeth (1973). Applying this procedure involves two-pass regression. The first pass regression indicates that the following time series least square regression method is estimated for each of the asset. Thus, the first pass is applied on the augmented version of the Fama and French (1992) three factor model.

$$E^1(r_a^1) = r_f^1 + \beta_{ij}r_{t+1}^1 \beta_{i,2}f_{i,2}^1 + \beta_{i,3}f_{i,3} + \varepsilon_i$$

The Parsimonious Multivariate GARCH-In-Mean Approach Theory

The *parsimonious multivariate GARCH-in-mean approach* permits the simultaneous testing of securities and or portfolios whereby the conditional measures of sensitivity betas vary over time (De Santis & Gerard, 1997). If a disturbance term orthogonal to the information available at the end of time t is added to the conditional equation, thus the econometric specification of the form is obtained as shown in equation (2.10)

Empirical review

The empirical review is presented in five major headings. The first heading discusses empirical studies on financial openness and stock market volatility, the second heading looks at exchange rate and stock market volatility; the third heading discusses empirical works on the linkage between inflation and stock market volatility, while the fourth and fifth heading discusses empirical work on total (systematic volatility and related literatures on idiosyncratic volatility.

Financial Openness and Stock Market Volatility

Many recent studies have been conducted to show the linkage between financial openness and stock market volatility. For instance, Flavin and Panopoulo (2009) examines the level of volatility across stable and unstable periods applying switching ARCH and GARCH models for a variety of asset classes. They opine that the switching models are advantageous in relation to other related univariate volatility measurement techniques. These two models have been used to test the stability of common shock transfers between country pairs. Their findings show that returns during stable periods are significantly positive whereas in unstable periods returns are negative. Also, the models flexibly allowed for detecting that common stocks are characterized on the average by high volatility. Their findings throw more weight behind their suggestion that international portfolio diversification remain a good option in times of financial crises. However, Gallali and Kilani (2010) opine that univariate models fail to take into account market fundamental structure influences as well as investors decision-making process with respect to equity investment strategies. Their study however opines that multivariate models while being superior are usually very difficult to understand and apply.

Exchanges Rate and Stock Market Volatility

Many studies have been conducted to show the linkage between exchange rate and stock market volatility. Ajaji and Mougoue (1996) picked daily data from 1985 to 1991 for eight advanced economies, and employed error correction model and causality test. They discovered that successive increase in aggregate domestic stock prices has a negative short-run effect and a positive long-run effect on domestic currency value. In his study on the relationship between exchange rate and stock market volatility, Akinifeshi (1987) found that there was an inverse relationship between exchange rate and stock Price volatility since a depreciating naira exchange rate causes stock market returns to fluctuate rapidly. From our review of

the empirical literature, it is also evident that the Standard Granger Causality method has been the most predominant model used in most studies. Among a few studies on emerging markets are Mishra (2004), Chortareas et al (2000), Granger et al (2000), and Apte (2001). They found a significant Positive relationship between stock prices and exchange rate while others, such as Solink (1987) reported a significant negative relationship between the variables. On the other hand, some studies, such as Choi, Fang and Fu (2008) showed the possibility of a weak or on relationship between stock price volatility and exchange rate movement.

Inflation and Stock Market Volatility

Many studies have been conducted to show the linkage between inflation and stock market volatility. For instance, Daferighe and Aje (2009) using annual data analysed the impact of real gross domestic product, inflation and interest rate on stock prices of quoted companies in Nigeria from 1997-2006. The result among others showed that low inflation rate resulted in increased stock prices of quoted firms in Nigeria. Their study suffers from misspecification drawbacks and spurious relationship. The high R^2 with suspected auto-correlated residuals signify that the conventional significant tests are biased. The integrated process of the variables was not analysed; neither are the individual tests of the series for random walks checked.

Relationship between systematic Volatility and Stock Returns

Systematic volatility is one of the crucial factors considered by rational investors as it affects the pattern of returns and risk. Empirical literature makes use of the standard deviation of stock returns as a measure of systematic volatility. The trend of the systematic volatility especially asset such as stock, is a major concern as it determines the level of uncertainty in its returns. Malkiel and Xu (1997) posits that volatility at the firm's level has increased tremendously in recent time, which suggest that knowing the trend of volatility important.

Previous studies on the upward trend of the systematic volatility report an increase in the behaviour of volatility trend at the firm level. Malkiel and Xu (1997) suggest that market volatility has increased over time at the firm level but observe no trend at the market level, which shows the benefit of increasing diversification of portfolio, that is, for a portfolio to be well diversified, such portfolio should contain little stocks. Campbell et al. (2001) uses monthly data with robust methodology as they considered the influence of market crash experienced in 1987 by fixing the number of firms in the sample and using both weekly and monthly stock returns instead of daily returns observation to estimate volatility. Their findings indicate that no significant trend in market volatility; and volatility at the firm level is high and significantly positive during the period of study. Goyal and Santa Clara (2003) found an upward trend of the average stock volatility were very high during recessions and about 85% of the aggregate volatility is explain by idiosyncratic volatility when compute by the CAPM model and about 80% when they used the Fama French three factor model. Campbell et al (2001) and Goyal and Santa Clara (2003) analyses were based on the US stock markets. Bali and Cakici (2006) identify zero relationship between the equal weighted average stock volatility and the value weighted portfolio returns on the New York Stock Exchange (NYSE) stocks from 1963 to 2001, respectively.

Relationship between Idiosyncratic Volatility and Stock Returns

This subsection presents the three different idiosyncratic volatility trends and relationships mentioned in the literature. Campbell et al (2001) argues that the total volatility for the Period of 1962 to 1997 increased at the firm level, while the idiosyncratic volatility increase during this period but the market volatility has zero direction for its trend in this same sample space. Campbell et al (2001) conclude that the increase in idiosyncratic volatility trend is due to the unforeseen shock on the expected future cash flow, discounted at a constant rate and as well as shock to the discount factor.

Methodology

This gives an overview of the methods, the procedures, modalities and the sequential steps the researcher adopted in the research work to ensure that the results of the investigation are dependable, accurate and valid. It present a careful description of the research design, the theoretical framework, model specification, method of analysis and data sources in order to arrive at very meaningful conclusions which helps achieve the objective of the study.

Model Specification and Estimation Technique

The proposed functional form of the model utilised is shown in equation (3.7), while the proposed econometric form of the model is as shown in equation (3.8).

$$SPV = f (FOPN, INFL, EXRT) \dots\dots\dots(3.7)$$

$$SPV = \alpha_0 + \alpha_1 FOPN + \alpha_2 INFL + \alpha_3 EXRT + U_t \dots\dots\dots(3.8)$$

Where,

SPV= Volatility of stock prices (used as proxy for stock market volatility)

FOPN= Financial openness

INFL= Inflation rate

EXRT= Exchange rate

U_t = Error term

The α priori Expectations are:

$\alpha_1 > 0$ (FOPN have a positive relationship)

$\alpha_2 > 0$ (INFL have a positive relationship)

$\alpha_3 < 0$ (EXRT have a negative relationship)

The dependent variable in the specified model is stock price volatility (SPV) while inflation, financial openness (FOPN) is measured as the ratio of the sum of foreign assets and liabilities to GDP in Nigeria. The impact of the variables on stock price volatility is also estimated using the EGARCH technique. For the study a model with a first-order EGARCH term and a first-order ARCH term.

Data Collection

Secondary data source will be adopted for the study. The data was obtained from the CBN Statistical Bulletin, and the Nigerian stock exchange fact book.

Data analysis

This perform the analysis that forms the basis for the empirical evaluation of the study. In order to conduct a non-spurious analysis, with results that truly estimates the intended long term relationship, we test also for time series properties of the entire information set, and its results constitutes a major part of our descriptive statistics. The next set of analysis involves the estimation of the univariate generalized autoregressive conditional heteroskedasticity (*GARCH*) model, with the aim of explaining the second moments of stock price behaviour.

Regression Analysis Result

The estimation of the model is done with respect to the effect of the independent variables on stock market volatility in Nigeria. The results of the estimated model are presented in Table 4.4. The R squared value of 0.224 is rather low and shows that only about 22 percent of the systematic variations in LSPV for the period were captured by the explanatory variables, which implies that the model may possess a weak explanatory ability. The overall significance of the model is determined by the F-statistic value. The F-value of 1.44 is quite low and does not pass the significance test even at the 5 percent level since this value is less than the 5 percent critical F-value of 3.91. The model does not therefore exhibit a high overall significance. Thus, we cannot reject the hypothesis of an insignificant log-linear relationship between stock price volatility and all the independent variables combined.

Table 4.4: Model for Fundamental Determinants Capital Market

Variables	Coefficient	T-Ratios
Constant	0.096	0.619
LINFL	0.088	2.177
FOPN	0.007	1.324
LEXRT	-0.029	-0.953
R = 0.224		= 0.069
F = 1.44		D.W. = 1.57

Source: Author’s computation extracted from E views 7.0 output

In order to determine the level of relevance of each of the explanatory variables in determining capital market changes, we consider each of their coefficients in terms of their signs and significance level. More importantly, the test of significance for each coefficient reveals that only the coefficient of INFL is significant at the 5 percent level since the t-value is greater than that of the 5 percent critical value. The coefficients of all the other variables fail the significance test at the 5 percent level.

The outcome of the result suggests that only inflation has any significant effect in predicting stock price volatility in Nigeria. Stock price volatility seems to move interdem (*together*) with inflation; as a rise in inflation tends to generate volatility in stock prices. Apparently, fundamental factors may explain stock price volatility in Nigeria. By considering the pattern of inflationary movement in Nigeria, the volatility of stock prices may be observed.

Volatility Analysis Result

The results of estimating the EGARCH model which was specified in chapter three is presented in Table 4.5. In the mean equation, the goodness of fit statistics is quite impressive. The R squared value of 0.971 is very high and shows that over 97 percent of the systematic variations in SP are explained by changes in its lagged value. The F-value is also highly significant at the 1 percent level, indicating a strong

Relationship between SP and its past values. The mean equation shows that the impact of lagged stock prices is significant at the 1 percent level. This confirms the correctness of adding the variable to correct for autocorrelation in the stock return series. The result also shows that, with a coefficient close to one, there seems to be a very long delay for share prices to return to their long run position after any shock. Thus, stock price shocks are seen to be persistent over time.

Table 4.5: The EGARCH Result

Variables	Coefficient	T-Ratios
Mean Equation		
Constant	0.341	2.874
LASI(-1)	0.990	57.96
Variance Equation		
Ω	-0.969	-0.333
α	-1.342	-2.876
γ	0.096	0.160
B	0.668	2.793
LINFL	0.312	0.444
FOPN	0.021	0.360
LEXRT	0.085	0.141
R = 0.224		= 0.069
F = 1.44		D.W. = 1.57

Source: Author’s computation extracted from E views 7.0 output

The equation of interest is that of the conditional variance which measures the effects of inflation, financial openness and exchange rate on stock price volatility. The results of the conditional variance equation are presented in the second section of Table 4.5. Unlike the OLS estimation, the result shows that, considering the role of each variable in the variance equation, all the coefficients fail the 5 percent significance test, indicating that these variables do not effectively predict volatility of stock prices in Nigeria. However, the signs of the coefficients report another dimension to the estimated relationship. Both inflation and financial openness have positive signs, implying that these factors tend to stimulate or intensify stock price instability in the market at a very weak level. Rising foreign financial participation seems to expose the stock market to vagaries. They also tend to convey easy amplification of short term disequilibrium that may come up in the capital market.

The mean term in the result (ω) is negative and also fails the significance test at the 5 percent level. This shows that generally, the position of stock prices at any given period has no effect on its pattern of volatility. The leverage effect (γ) in the output fails the significance test at the 5 percent level even though it has the correct negative sign, so there appears to be no asymmetric effect in stock prices. This indicates the non-existence of any leverage effect in future prices during the sample period; as no form of information in the market could be said to be more destabilizing since is not significantly different from zero. The market tends to maintain its pattern irrespective of information flows or arbitrary news generated from outside the system. The α parameter represents the “GARCH” effect. The coefficient of this term is negative and highly significant at the 1 percent level. This shows the tendency of stock prices gaining a downward slide at any given shock.

The parameter β measures the persistence in conditional volatility irrespective of anything happening in the market (Alexander & Later, 2004). The β term is positive and relatively large, e.g. above 0.67. This shows that volatility takes long time to die out following a crisis in the Nigerian stock market. This outcome was also implied in the mean equation. Thus, long term measures must be put in place when addressing short term arbitrary shocks in stock prices in Nigeria.

Test of Research Hypotheses

The test of the research hypotheses stated in the null form, in this study is based on the outcomes of the univariate EGARCH model estimated and reported in section 4.5.

Hypothesis One

H₀₁: Changes in the level of inflation do not significantly lead to volatility in stock prices in Nigeria.

From the result shown in Table 4.5, all the coefficients fail the 5 percent significance test, indicating that inflation does not significantly lead to volatility of stock prices in Nigeria. However, the signs of the coefficients report another dimension to the estimated relationships. Inflation has a positive sign, implying that inflation tend to stimulate or intensify stock price instability in the market at a very weak level. Inflation also tends to convey easy amplification of short term disequilibrium that may come tip in the capital market Therefore, the null hypothesis that Changes in the level of inflation do not significantly lead to volatility in stock prices in Nigeria is accepted.

Hypothesis Two

H₀₂: Changes in the level of financial openness do not significantly lead to stock market volatility in Nigeria.

From the result shown in Table 4.5, all the coefficients fail the 5 percent significance test, indicating that financial openness does not significantly lead volatility of stock prices in Nigeria. However, the signs of the coefficients report another dimension to the estimated relationships. Financial openness has a positive sign, implying that it tends to stimulate or intensify stock price instability in the market at a very weak level. Financial openness also tends to convey easy amplification of short term disequilibrium that may come up in the capital market. In addition, the inflow of financial liabilities tends to affect volatility in Nigerian stock market prices. The pattern of effect is negative where these inflows tend to dampen any volatility in the market. This may be due to the fact that liability inflows generate a more responsible management of the market. However, financial openness exerts a relatively weak impact on stock market volatility in Nigeria. Therefore, the null hypothesis that changes in the level of financial openness do not significantly lead to stock market volatility in Nigeria is accepted.

Hypothesis Three

H₀₃: Fluctuations in the level of exchange rate do not significantly lead to stock market volatility in Nigeria.

From the result shown in Table 4.5, all the coefficients fail the 5 percent significance test, indicating that fluctuations in exchange rate does not significantly lead to volatility of stock prices in Nigeria. Therefore, the null hypothesis that fluctuations in the level of exchange rates do not significantly lead to stock market volatility in Nigeria is accepted.

Conclusions

Stock market volatility tends to be sticky. This means that the volatility level over a certain period of time remains until some material change in fundamental variables (like inflation, financial openness and

exchange rate) occur. This could lead to a heightened level of uncertainty in a country's bourse. However, it must be noted that although volatility is a reflection of risk, it needs not necessarily be feared at normal levels; rather, it should be accepted as a necessary part of the risk and return relationship in organized capital markets world-wide. From our analysis, it was observed that inflation and financial openness have a positive but insignificant impact on stock price volatility while exchange rate has a negative and insignificant impact on stock price volatility. Therefore, Nigerian investors are advised not to significantly alter their asset allocation plan in response to short-term changes in volatility. They should also endeavour to review their long-term volatility expectations when engaged in any form of strategic asset allocation activity.

Recommendations

On the basis of the research findings, we recommend the following measures as veritable means of coping with the issue of volatility in the Nigerian bourse.

1. Regulatory financial authorities should adopt guided financial openness where aspects of foreign participation that are critical should be factored in and leveraged in other to improve the stock market.
2. More focus should be directed at attracting foreign financial inflows that are permanent in nature. This is because easily reversible inflows are bound to generate instability in the stock market.
3. African countries should strive to develop and implement detailed capital market master plans and country specific reforms, in order to reduce their vulnerability to external financial crises in the future. In particular, such reforms should be guided by the adoption of international best practices, and standards covering issues such as banking system regulation and supervision, data dissemination, corporate governance, transparency in monetary policies, capital market trading activities, and accounting standards.
4. There is a need for African markets to focus more seriously on their capital markets as possible channels for volatility transmission, spill-over and contagion.
5. Furthermore the repositioning of the capital market as a pivot for domestic investment growth is critical in order to balance the investment climate in African countries.
6. We therefore advocate that policymakers in their bid to formulate and execute policies aimed at stabilising the domestic financial markets in Nigeria, should also take into consideration global factors from external markets such as those in tree US, UK or those other world markets.
7. The Nigerian bourse should be expanded in terms of depth and breadth; whereby foreign stockholdings in domestic companies is enhanced through a transparent and easily understood process.
8. Efficient exchange rate management should be adopted by government which take into account the relevance of the stock market as possible significant strong economical indices, when addressing the issue of exchange rate management.

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