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An Appraisal of Stock Market Prices Volatility before Democratic Era in Nigeria

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Abstract

This study appraised stock market prices volatility before the democratic period in Nigeria. It examined the degree and persistence of volatility for the period of January 1985 to May 1999 using GARCH (1,1) model. The result of the empirical analysis revealed that the components of ARCH and GARCH terms is close to one and greater than 0.5 which means that stock market prices has high level of volatility in Nigeria for the period before democracy. Therefore, the sum of the square error term and conditional variance revealed that stock price volatility exist during the period under review. In the same vein, interest rate as appeared in the model depicts that it is an outside shock that influence the volatility in stock market price in Nigeria, while inflation and exchange rate were showed that the variables cannot be transmitted to the volatility in stock prices for the period of study. Hence, it was recommended that variables the influence the volatility of stock market prices should be identified and policies should be formulated to reduce increasing level of volatility of stock market prices.

JEL Classification: stock prices, Volatility, Democracy, ARCH, GARCH

INTRODUCTION

The stock market plays a major role in financial intermediation in both developed and developing countries. It is an integral part of any economy in the modern world which is beneficial for the transfer of funds from surplus entities (savers) to deficient entities (investors). As the economy of a nation develops, more resources are needed to meet the rapid expansion in economic activities which necessitated the establishment of the stock exchange (Adeniji, 2015).

The stock market serves as a channel through which savings of the surplus earners are mobilized and efficiently allocated to achieve economic growth, the allocation of such surplus fund helps in enhancing capacity utilization and promoting productive activities in the economy. The banking system and the stock exchange works together to achieve the macroeconomic objective of the economy, the bank being the custodian of money help through the stock exchange to pool large and long term capital resources through issuing of shares and stocks by industries in dire need of finance for expansion purposes. Thus, the overall development of the economy is a function of how well the stock market performs.

In recent years, inquiry into the link between nominal stock market prices and their volatility has produced a number of stylized facts in the literature. For instance, alluding to the fact that the stock market performance depends on not only the overall fitness of the financial markets and macroeconomic stability, but, the external markets as well, burgeoning evidences suggest volatility clustering, that is, large (small) shocks tend to follow similar large (small) shocks.
Volatility may impair the smooth functioning of the financial system and adversely affect economic performance (Rajniand & Mahendra, 2007; Mollah, 2009).Volatility measures variability, or dispersion about a central tendency. It is simply a measure of the degree of price movement in a stock, futures contract or any other market. It measures dispersion around the mean or average return of a security and the range of an asset price about its mean level over a fixed amount of time (Abken & Nandi, 1996). It follows that volatility is linked to the variance of an asset price.

If a stock is labeled as volatile, then the price will vary greatly over time. Conversely, a less volatile stock will have a price that will deviate relatively little over time. Volatility is calculated as the standard deviation from a certain continuously compounded return over a given period of time. It is an important measure of quantifying risk. For example, a security with a volatility of 50% is considered very high risky because it has the potential to increase or decrease up to half its value. Volatility is a measure of risk based on the standard deviation of the asset return. It is a variable that appears in option pricing formulas, where it denotes the clustering of the underlying asset return from now to the expiration of the option (Karolyl, 2001; Mordi, 2006).
Stock prices are characterized by volatility when significant changes occur, investors tend to panic. Different factors influence the movement in stock prices. Notable among these factors are: arrival and disclosure of new information, demand and supply forces, investor psychology, economic strength of the market, uncertainty about the future economic outlook.

Political system significantly influences financial markets. Stock markets generally respond to new information regarding political decisions that may affect domestic and foreign policy. As such, market efficiency requires that stock markets absorb news and political events into stock prices in anticipation of outcomes of political uncertainty which occur often depending on the political system in operation in the country. Hence positive stock prices volatility is expected following the resolution of political uncertainty. In contrast, if the outcome of the political uncertainty does not allow investors to immediately measure the negative impact on the stock market, then the political outcome constitutes an uncertainty inducing surprise.

Volatility of stock prices in the stock market is no doubt depends on the financial development in the stock market which in turn depends on the political system in the country. Political system in Nigeria evolved over three eras; the pm-colonial era, colonial era, and the era since independence. In the first years after independence, Nigeria struggled to make the parliamentary style of government work, and then settled into military dictatorships by 1966, interspersed with attempts' to establish a civilian-led democracy. The journey to the present democratic experience in Nigeria commenced on May 29, 1999, when the military government returned power to civilian administration.

Hence, with the above backdrop, this study seeks to appraise the degree and persistence of stock prices volatility in the Nigerian stock market before the era of democracy. Following this introduction, the rest of the paper is structured as follows: section two reviews literatures related to the study, section three presents the methodology of the study, while section four presents analysis and interpretation and section five concludes the paper.

LITERATURE REVIEW

The performance of the stock market is influenced by a number of factors, the main ones among, them being the activities of governments and the general performance of the economy. Extensive studies have been carried out in America and Britain examining the performance of stock markets before and after general elections. They have also examined the performance of the stock markets based on the party of the President or Prime Minister in Power. These studies indicate that the stock market react differently based on the party of the President elected in America while there was no difference in Britain.

Relationship between presidency and stock market has shown very prudently by Ray and Marshall (2012). They focused on the relationship between U.S. political parties holding presidential office and S&P 500 performance, volatility and risk. The research encompassed specific years within presidential cycle and evaluated price change over time. They also made observations to determine if there were any relationships between the political party in office and historical stock market performance. They described through Descriptive observations that the average S&P 500 nominal returns shows 55.03 percent and 23.48 percent for the two different governments period in USA for the period of January 20, 1949 to projected January 20, 2013. To minimize the argument regarding inflation, they made further adjustments using the Consumer Price Index chain with a base year of 1980 equal to 100. The results were more modest. They also found that, while the descriptive observations would suggest some difference between the political parties holding the presidency and the performance of the S&P 500, there was no significant statistical difference between the political party that holds the government and S&P 500 performance at the 95 percent level of confidence both in the nominal as well as in the adjusted composite price levels

Roland and Michael (2007) analyzed the impact of expected government partisanship on stock market performance in the 2002 German federal election. Their results showed that small-firm stock returns were positively (negatively) linked to the probability of a right- (left-) leaning coalition winning the election. Moreover, they found that volatility increased as the electoral prospects of right-leaning parties improved, while greater electoral uncertainty had a volatility-reducing effect. Jedrzej, Katrn and Tomasz (2006) performed an analysis of 24 stock markets and 173 different governments and found that there are no statistically significant differences in returns between left-wing and right-wing executives. Consequently, international investment strategies based on the political orientation of countries' leadership are likely to be futile.

Oumar and Ashraf (2011) examined the link between stock returns and the presidential cycle in the United States. They investigated whether there is a risk-based explanation for higher returns during Democratic presidencies compared with Republican presidencies. The findings show that the market exhibits higher returns when Democrats control the presidency, with smaller companies experiencing the, most significant improvement. Santa-Clara and Valkanov, (2003) found that there was a higher excess return in the stock market (using a stock market index compared to three-month Treasury Bill) when Democrats were in office. According to their research, which does not include the last two presidential terms, the excess returns were 09 percent for the value weighted stock indexes and 16 percent for the equal weighted portfolio.
Beyer, Jensen, and Johnson, (2004) showed that political gridlock as well as monetary expansion and restrictive fiscal policies had effects on security performance. They concluded that the evidence is contrary to popular opinion that the stock market benefits from political gridlock, After controlling for shifts in the political landscape, they found strong evidence that shifts in Fed policy have a significant relationship with the security returns.

Nikhar, (2013) used the surprise, positive jolt that Osama Bin Laden's capture gave to Barack Obama's 2012 re-election prospects to study the relationship between business campaign contributions, political connections, and stock market valuation changes. He found that following Bin Laden's death, firms that had previously donated to Democrats registered significant positive returns whereas firms that had donated to Republicans registered significant negative returns. His findings indicate that campaign contributions serve as financial investments that can yield major valuation payoffs to firms because investors view these as signals of political connections. Ansolabehere, Snyder Jr. and Ueda, (2004) found that these rulings appear to have had no noticeable effect on the stock prices of firms that were directly affected leading the authors to conclude that the fundamental critique of campaign finance in America-that donations come with a quid pro quo and extract very high returns for donors-is almost surely wrong.

Asongu (2012) assessed the incidence of political institutions on stock market performance dynamics in Africa. He employed Two-Stage-Least Squares Instrumental Variable method Channels of democracy, polity and autocracy are instrumented with legal-origins, religious-legacies, income-levels and press-freedom qualities to account for stock market performance dynamics of capitalization, value traded, turnover and number of listed companies. To ensure robustness of the analysis, the following checks were carried out: usage of alternative indicators of political institutions; employment of two distinct interchangeable sets of moment conditions that engender every category of the instruments; usage of alternative indicators of stock market performance; account for the concern of endogeneity; usage of Principal Component Analysis (PCA) to reduce the dimensions of stock market dynamics and political indicators and then check for further robustness of findings in the regressions from resulting indexes. The findings broadly demonstrate that democracy improves investigated stock market performance dynamics.
Therefore, it can be deduced from the positions of several authors in the above lines of thought that, most of the previous studies in this area have been primarily concerned with the impact of political events such as elections, wars and terrorist attacks, political uncertainty arising from civil uprisings etc. on the stock market and works that considered democracy examined its impact on stock market return. Hence, this research work seeks to fill the gap by appraising the volatility of stock price taking into consideration the period before democracy.

Methodology

3.1 Model Specification

The volatility of stock prices before democracy is estimated using GARCH models. The GARCH models introduced by Bollerslev (1986) have been the most commonly employed class of time series models in recent finance literature for studying volatility. The strength of the model is its ability to capture both volatility clustering and unconditional return distribution with heavy tails. In general, the GARCH (p,q) can be represented as follows:

$$Y_t = \lambda_0 + \sum_{t-1}^{k} \lambda_1 Y_{t-1} + \varepsilon_t \quad \ldots 3.1$$

$$\text{Where; } \varepsilon_t \sim N(0, \delta_t^2) \quad \ldots 3.2$$

$$\delta_t^2 = \varphi + \sum_{t-1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j}^{p} \beta_j \delta_{t-1}^2 \quad \ldots 3.3$$

Estimation of the model involves joint estimation of a mean and conditional variance equation. Equation (3.1), the conditional mean equation, is an autoregressive process of order k (AR(K)). The parameter λ_0 is the constant, k is the lag length, ε_t is the heteroscedastic error term with its conditional variance (δ^2_t). Equation 3.3 is the conditional variance equation specified as the GARCH (p,q) model where p is the number of ARCH terms, and q is the number of GARCH term. Several literature such as (Akgiray, 1989; Connaly, 1989; Baillie and DeGennaro, 1990; Bera and Higgins, 1993; Floros, 2008, among others) showed that a simple GARCH model is parsimonious and generally gives significant result. Therefore, this research work employed GARCH (1,1) model to estimate the predicted volatility of the stock price prior to democratic system of government in Nigeria.

Hence, for the purpose of our analysis, GARCH (1.1) model is given as thus:

$$ASI_t = \alpha_1 + \alpha_2 ASI_{t-1} + \varepsilon_t \quad \ldots 3.4$$

$$\text{Where; } \varepsilon_t \sim N(0, \delta_t^2) \quad \ldots 3.5$$

$$\delta_t^2 = \alpha_3 + \alpha_4 \delta_{t-1}^2 + \alpha_5 \varepsilon_{t-1}^2 + \alpha_6 INF_t + \alpha_7 EXR_t + \alpha_8 INT_t \quad \ldots 3.6$$

Equation 3.4 is the mean equation and the variables are define as follows; ASI_{t-1} is the previous stock price given suggestion that volatility of stock price in the current period is related to volatility of stock price in the past period, ε_t is the error term or the residual term

Equation 3.6 is the variance equation for GARCH (1.1) model and the variables are defined as follows: δ_t^2 is the variance of the residual (error term) derived from the mean equation, it is also known as current day's variance or volatility of stock price; α_3 is the constant from the equation, δ_{t-1}^2 is the previous period residual variance or volatility of stock price known as GARCH term; ε_{t-1}^2 is the previous period's squared residual derived from the mean equation know as ARCH term; INF is the inflation rate (consumer price index); EXR is the exchange rate of Naira/Dollars in Nigeria; INT is the interest rate.

Note that INF, EXR and INT are exogenous variables which can also be referred to as the variance regressor as they can also contribute in the volatility of stock price. It is expected that stock market prices volatility responded positively to all these variables.

Estimation Techniques

Unit root test

In testing for stationarity, two standard procedures of unit root test namely the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests are employed as a prior diagnostic test to examine the stochastic time series properties of variables in the model. This enables us to avoid the problems of spurious result that are associated with non-stationary time series models.

Cointegration test

Also, cointegration test is employed to determine the number of co-integrating vectors using Johansen's methodology with two different test statistics namely the trace test statistic and the maximum Eigen-value test statistic. The trace statistic tests have the null hypothesis that the number of divergent co-integrating relationships is less than or equal to 'r' against the alternative hypothesis of more than 'r' co-integrating relationships, and is defined as:

$$\theta_{trace}(r) = -T \sum_{j=r+1}^{p} In\left(1 - \hat{\theta}_j\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.8$$

The maximum likelihood ratio or the maximum Eigen-value statistic, for testing the null hypothesis of at most `e co-integrating vectors against the alternative hypothesis of `r+1 'co-integrating vectors, is given by:

$$\theta_{max}\,(r, r+1) = -T\, In\left(1 - \hat{\theta}_{r+1}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.9$$

Where $\hat{\theta}_j$ = the Eigen values, T = total number of observations. Johansen argues that, trace and statistics have nonstandard distributions under the null hypothesis, and provides approximate critical values for the statistic, generated by Monte Carlo methods. In a situation where Trace and Maximum Eigenvalue statistics yield different results, the results of trace test should be preferred.

Measurement of volatility

After the test of stationarity, the volatility of stock price will be estimated using GARCH (1.1) model introduced by Bollerslev (1986) to estimate the volatility of stock price from January 1980 to May 1999 marking the period before democracy in Nigeria.

Nature and Sources of Data

This study relied on secondary source of data. Monthly data from January 1980 to May 2009 were collected from; CBN Statistical Bulletin 2013, CBN Website, The Nigeria Stock Exchange Fact Book various issues.

DATA ANALYSIS AND INTERPRETATION

Unit Root Test

This study commenced it empirical analysis by first testing the properties of the time series used for analysis. We perform a unit root test on each of the variables since they are time series in nature. This enables us to avoid the problems of spurious result that are associated with non-stationary time series model. The test is conducted using two different unit root models. That is, the Augmented Dickey Fuller (ADF) model and the Philips-Perron (PP) model. The results are presented and interpreted in table 4.1:

Table 4.1: Unit Root Test Result Before Democracy

VARIABLE		Augmented Dickey-Fuller (ADF) Test			Phillip-Perron (PP) Test		
		@ Level	**@ 1st Difference**	**Status**	**@ Level**	**@ 1st Difference**	**STATUS**
LAST		-1.014244	-3.856905*	I(1)	-0.782756	10.91099*	I(1)
LSMC		-0.985821	-6.309052*	1(1)	-0.843055	-10.59620*	I(1)
INF		-2.322629	-15.26442	1(1)	-1.214066.	-15.36524*	I(1)
INT		-2.291912	-3.510043*	I(1)	-1.136638	-20.90309*	I(1)
EXR		-0.224322	-13.10877	I(1)	-0.216653	-13.10891*	I(1)
CRITICAL VALUE	**1%**	-3.504727	-3.504727		-3.504727	-3.504727	
	5%	-2.893956	-2.893956		-2.893956	-2.893956	
	10%	-2.584126	-2.584126		-2.584126	-2.584126	

SOURCE: Author's Computation

Notes: * indicates significant at one percent or a rejection of the null hypothesis of no unit root at the one percent level ** indicates significant at five percent or a rejection of the null hypothesis of no unit root at the five percent level. Number of lags was selected using the AIC criterion.

The result presented in table 4.1 revealed that the variables were not stationary at level meaning that the null hypothesis of unit root cannot be rejected since the asymptotic critical values are less than the calculated values of ADF and PP. After all the variables were transformed to their first difference, the null hypothesis of unit root was rejected and the variables became stationary. Therefore, they are said to maintain stationarity at an integration of order one, I (1).

Lag Length Selection Test

The Schwarz information criterion (SC) is used to select the optimal lag length considering the smaller value of information criterion. Hence, lag one is selected for the study as presented in table 4.2:

Table 4.2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4381.989	NA	1619388.	28.48694	28.54750	28,51116
1	-1247.975	6145.925	0.002765	.8.298536	8.661858*	8.443809
2	-1212.889	67.66489	0.002590	8.233046	8.899135	8.499379
3	-1150.699	117.9191	0.002035	7.991551	8.960409	8.378945
4	-1098.429	97.41296	0.001706	7.8 4471	9.086096	8.322925*
5	-1077.616	38.11158	0.001754	7.841661	9.416054	8.471176
6	-1045.634	57,70477	0.001678*	7.795679*	9.672839	8.546254
7	-1022.601	40.50649*	0.001704	7.809095	9.989024	8.680731
8	-1004380	31.59082	0.001785	7.853115	10.33581	8.845812

SOURCE: Author's Computation

Indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level).
FPE: Final Prediction Error

AIC: Akaike Information Criterion
SC: Schwarz Information Criterion
HQ: Hannan-Quinn Information Criterion

Cointegration Test

Having established that the variables are integrated of the same order, we proceed to testing for cointegration. The Johansen-Juselius maximum likelihood procedure was applied in determining the cointegrating rank of the system and the number of common stochastic trends driving the entire system. We report the trace and maximum Eigen-value statistics and its critical values at 5% in the tables 4.3.

Table 4.3: Cointegration result Before Democracy

Unrestricted Cointegration Rank Test (Trace)				Unrestricted Cointegration Rank Test (Max-Eigen)		
Hypothesizd No. of CE(s)	Eigen-vale	Trace Statistic	0.05 Critical Value	Eigen-Value	Maxi-Eigen Statistic	0.05 Critical Value
None *	0.259888	102.9785	69.81889	0.259888	49.95841	33.87687
At most 1*	0.125339	53.02013	47.85613	0.125339	22.23049	27.58434
At most 2*	0.100340	30.78964	29.79707	0.100340	17.55252	21.13162
At most 3	0.044460	13.23712	15.49471	0.044460	7.549432	14.26460
At most 4	0.033683	5.687686	3.841466	0.033683	5.687686	3.841466
*denots rejection of the hypothesis at the 0.05 level.						
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level						
Max-eigenvalue test indicates I cointegrating eqn at the 0.05 level						

Source: Authors' Computation

The result of multivariate co integration test based on Johansen and Juselius co integration technique reveal that there are two co integrating equations at 5% for the trace statistic and one co integrating equation for Max-Eigen.

Measurement of Stock market price volatility

In other to measure the volatility of stock price, there is need to first check whether the series is characterized, by ARCH effects. To do this, we estimate equation 3.4 i.e the mean equation in section three and we plot the graph of the residual of the estimated result. These are shown below:

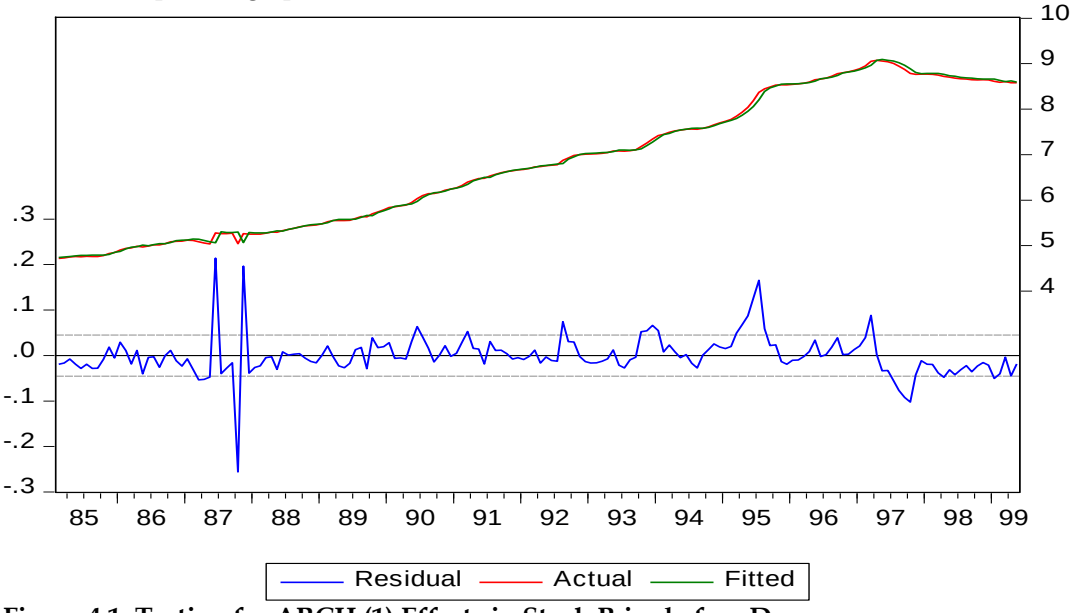

Figure 4.1: Testing for ARCH (1) Effects in Stock Price before Democracy

From the time plot of the series in figure 4.1 it is clearly showed that there were period with larger and smaller volatility in the sample i.e there was a prolonged period-of low volatility at some point (1985 – 1987) and a prolonged period of high volatility (1987 - 1988). In other words, the period of high volatility were followed by period of high volatility and the period of low volatility were followed by that of low volatility. Therefore, the above suggest that residual or error term is conditionally heteroscedastic and it can be represented by ARCH and GARCH model.

Volatility before Democracy Period

Table 4.6: ARCH and GARCH Model Result

Variable	Coefficient	Std Error	Z-Statistic	Prob.
Mean Equation				
C	0.01314	0.007943	1.663653	0.0962
D(LASI(-1))	0.176527	0.120066	1.470245	0.0415
Variance Equation				
C	0.002761	0.000549	5.027444	0.0000
ARCH(-1)	0.112359	0.089854	1.250452	0.0111
GARCH(-1)	0.470688	0.019907	23.64417	0.0000
D(INF)	-3.97E-05	0.000355	-0.111854	0.9109
D(INT)	-0.001277	0.001684	-0.758164	0.0484
D(EXR)	0.000103	0.000192	0.537577	0.5909
Degree/Severity and Persistency				
Degree of Volatility	0.583047			
Mean of Volatility	0.011553			
Persistency D(LASI(-1)	0.176527			
Residual Diagnostic				
Jarque Bera	3.269677			
Prob.	0.98921			
Heteroskedasticity Test: ARCH				
F- Stat	0.415184			
Prob.	0.94272			

Source: Authors' Computation

Table 4.6 revealed the result of GARCH(1,1) model using the normal Gaussian distribution, ARCH effect was found significant meaning that information about previous values of stock market influences today's stock market volatility. Also, GARCH effect was found significant which indicates that previous period volatility in stock market price can influence today's stock market price volatility. It then means that stock market price is influenced by ARCH and GARCH factors of its own shocks for the period of study.

Interest rate was also significant meaning that it is an outside shock that influence the volatility in stock market price in Nigeria, while inflation and exchange rate were found to be insignificant which is an indication that, the variable cannot be transmitted to the volatility in stock price.

Residual diagnostic test result shows that, the null hypothesis of no serial correlation, no ARCH and that the residual is normally distributed were accepted as the probability values were less than 5%.

To ascertain the degree and severity of stock price volatility in Nigeria before democracy, the components of ARCH and GARCH terms estimated in the variance equation presented in table 4.6 are summed. The sum of the ARCH and GARH coefficients ($\alpha_4 + \alpha_5$) is 0.450737 + 0.528290 = 0.979027 which is close to one and greater than 0.5. This is a clear indication that volatility of stock price is present and persistent in Nigeria. Therefore, the sum of the square error term and conditional variance revealed that stock price volatility exist during the period under review.

SUMMARY AND CONCLUSION

This study appraised the existence of volatility in stock prices in an era of democracy in Nigeria. For this purpose, we examined the degree and persistence of stock prices volatility in the stock market for the period of 1985:1 to 1999:5. Using GARCH (1,1) model, the result revealed that the components of ARCH and GARCH terms is close to one and greater than 0.5 which means that volatility is highly present in stock market prices in Nigeria for the period before democracy. Therefore, the sum of the square error term and conditional variance revealed that stock price volatility exist during the period under review. In the same vein, interest rate as appeared in the model depicts that it is an outside shock that influence the volatility in stock market price in Nigeria; while inflation and exchange rate were showed that the variables cannot be transmitted to the volatility in stock prices for the period of study.

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