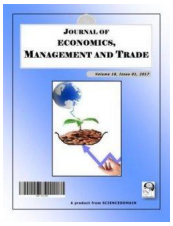

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Impact of Monetary Policy on Stock Market Prices in Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author OOJ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author ADO managed the analyses of the study and literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

The paper investigated the relationship between monetary policy and stock market prices in Nigeria and through assess whether monetary policy influences stock market prices, for the period 1985 to 2015. The Dynamic and Fully Modified Ordinary Least Squares (DOLS & FMOLS) techniques were used for the analysis, while the error correction model (ECM) framework was deployed for robustness. A long-run equilibrium relationship was found among the variables used. The empirical results indicated that monetary policy rate, credit to private sector, exchange rate and broad money supply are positively related to stock market prices captured by the all share index in either the DOLS or FMOLS frameworks. Exchange rate and broad money supply were found to have statistically significant impact on stock market prices. The estimated ECM equations showed that the short-run determinants of stock prices are largely from are credit to private sector, exchange rate and one period lagged exchange rate; while monetary policy rate and broad money supply have a negative relationship with stock market prices in the short-run. It is therefore evident from the results of this study that some monetary policy instruments can be a better predictor of stock market prices in Nigeria. In the light of this, it is recommended that monetary authorities should be

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cautious enough to avoid discretionary policies that might hike the rate of interest; otherwise the flow of fund to the market will be derailed. Also, the government should fine turned the exchange rate policy and institute a consistent policy plan to mobilize surplus funds from abroad, which would be injected into the capital market for significant development

Keywords: Monetary policy; Nigerian stock market; monetary instruments; asset pricing.

JEL codes: F21, E51, G24, G12.

1. INTRODUCTION

Monetary policy connotes interest rate, exchange rate, credit allocations and other financial policy intervention programmes that promote economic growth. Monetary policy can act as growth catalyst by creating an enabling environment with appropriate incentives to empower innovative entrepreneurs to drive inclusive growth. Extant economic literature has identified five main monetary transmission channels (interest rates, asset prices, exchange rates, credit and expectations) through which monetary policy can affect real economy and promote growth. Changes in monetary policy tend to influence aggregate demand, growth, and inflation through various transmission channels and induce changes in employment as a result. However, monetary policy actions such as changes in the Central Bank monetary policy rate have at best an indirect effect on these variables and considerable lags are involved in the policy transmission mechanism. For example the stock market, government and corporate bond markets, mortgage markets, foreign exchange markets, are quick to incorporate new information. Therefore, a more direct and immediate effect of changes in the monetary policy instruments may be identified using capital market data. Identifying the link between monetary policy and stock market prices in Nigeria is highly important to gain a better insight in the transmission mechanism of monetary policy, since changes in stock market prices play a key role in several channels.

Stock prices are among the most closely monitored asset prices in the economy and are commonly regarded as being highly sensitive to economic conditions. In the context of the transmission mechanism through the stock market, monetary policy actions affect stock prices, which themselves are linked to the real economy through their influence on consumption spending; wealth effect channel, investment spending and balance sheet channel [1,2]. As [3] pointed out, some observers view the stock market as an independent source of macroeconomic volatility to which policymakers may wish to respond. Stock prices often exhibit pronounced volatility and boom–bust cycles leading to concerns about sustained deviations from their 'fundamental' values that, once corrected, may have significant adverse consequences for the broader economy. Hence, establishing quantitatively the link between monetary policy and stock market prices in Nigeria will not only be germane to the study of stock market but will also contribute to a deeper understanding of the conduct of monetary policy and of the potential economic impact of policy actions or inactions.

Theoretically, the present value or discounted cash flow model offers useful insights on the stock market effects of monetary policy changes. According to the discounted cash flow model, stock prices are equal to the present value of expected future net cash flows. Monetary policy should then play an important role in determining equity returns either by altering the discount rate used by market participants or by influencing market participants' expectations of future economic activity. These channels of influence are interlinked since more restrictive monetary policy usually implies both higher discount rates and lower future cash flows [4]. Thus, monetary policy tightening should be associated with lower stock prices given the higher discount rate for the expected stream of cash flows and/or lower future economic activity. In contrast, an expansive monetary environment is commonly viewed as good news as these periods are usually associated with low interest rates, increases in economic activity and higher earnings for the firms in the economy. Consequently, stock market participants pay close attention to strategies based on the stance of the monetary authority as inferred by changes in indicators of Central Bank policy. Also, the financial press often interprets asset price movements as reaction to monetary policy shifts, attributing for instance increases in stock markets to low interest rates [5].

It is against this theoretical background that financial economists have sought to establish if and/or to what extent does monetary policy influences stock market prices. Previous empirical evidence broadly supports the notion that restrictive (expansive) monetary policy decreases (increases) contemporaneous stock returns, as well as expected stock returns [4,5,6, 3,7,8,9,10,11,12]. Majority of these studies typically relate stock returns to measures of monetary policy stringency in the context of single equation specifications and/or multivariate Vector Autoregressions (VAR's). However, various literatures showed that VAR models suffer from over-parameterization, and many different approaches have been proposed in order to obtain more efficient estimates. It is therefore germane to employ appropriate estimators in order to overcome this problem. In the present study, the Dynamic Ordinary Least Squares (DOLS) estimator, engineered by [13] and the Fully Modified Ordinary Least Squares (FMOLS), originally developed by [14] were adopted. Both the DOLS and FMOLS approach introduces dynamics in the model specified while allowing for simultaneity bias. Thus, this study added to the literature by varying on the period covered, methodology adopted, variables used, and frequency of data among other factors to examined the empirical linkage between monetary policy and stock market prices in Nigeria. This helps to validate past findings or bring forth new issues on the subject for further research.

2. LITERATURE REVIEW

2.1 Concept of Stock Market

A stock market, or equity market, is a private or public market for the trading of company stock and derivatives of company stock at an agreed price; these are securities listed on a stock exchange as well as those only traded privately. In other words, a stock market or exchange is the centre of a network of transactions where securities buyers meet sellers at a certain price.

2.2 Empirical Issues

[5] Examined whether shifts in the stance of monetary policy can account for the observed predictability in excess stock returns. Using long-horizon regressions and short-horizon vector autoregressions, he concluded that monetary policy variables are significant predictors of future returns, although they cannot fully account for observed stock return predictability.

[4] Used a standard VAR in which monetary policy innovations are identified by Cholesky decomposition to investigate the relationship between monetary policy and asset prices in the U.S. Using various measures of monetary policy stance, he found evidence indicating that expansionary monetary policy increases ex-post stock returns. Specifically, he found that a one-standard deviation positive innovation in the federal funds rate depressed stock returns by an average of -0.80 percent per month and a one-standard deviation positive innovation in non-borrowed reserves increased stock returns by an average of 1.79 percent per month.

[15] Used standard vector autoregressions (VAR) technique to quarterly data for Botswana for the period 1993-2010 to investigate the impact of monetary policy shocks on stock returns. Their results indicated that positive interest rate innovations are associated with increases, rather than decreases, in the aggregate stock returns of companies listed on the Botswana Stock Exchange (BSE). They noted that a possible explanation for the counter-intuitive result is that the market capitalization in BSE is dominated by commercial banks, which are also the main beneficiaries of the interest income from investment in risk-free Bank of Botswana Certificates. They also observed that the positive reaction of aggregate stock returns to monetary policy tightening suggests that the increase in returns to bank stocks offsets the negative reactions of non-bank stock returns. Variance decomposition shows that monetary policy shocks explain a relatively small proportion of stock returns variability in BSE.

[16] Examine the relationships between stock market capitalization rate and interest rate. They found that prevailing interest rate exerts positive influence on stock market capitalization rate. They also found that government development stock rate exerts negative influence on stock market capitalization rate and prevailing interest rate exerts negative influence on government development stock rate.

[7] Investigated the effect price deviations from random walks result from seasonal of the monetary policy on stock returns in thirteen OECD countries over the period 1972-2002. They regressed the stock market variable on the monetary policy variable and found that stock returns decrease when money supply decreases.

Their findings indicate that monetary policy shifts have significant negative impact on both nominal and inflation-adjusted stock returns. This relationship was significantly different from zero at the 5 percent level in 10 out of 13 countries. However, the strengths of the links differed from one country to another possibly because of their inherent structural differences.

[10] Examined the long-run and short-run macroeconomic shocks effect on the Nigerian capital market between 1984 and 2007. They examined the properties of the time series variables using the Augmented Dickey-Fuller (ADF) test and Error Correction Model (ECM). However, the empirical analysis showed that the NSE all-share index is more responsive to changes in exchange rate, inflation rate, and money supply and real output. Therefore, all the incorporated variables that serve as proxies for external shock and other macroeconomic indicators have simultaneous significant impact on the Nigerian capital market both in the short and long-run.

[17] Investigated the effect of monetary policy on stock market performance in Nigeria using Ordinary Least Square; Co-integration and Error correction model. It was discovered that stock market performance is strongly determined by broad money supply, exchange rates and consumer price index in the short and long-run.

[9] Used Ordinary Least Squares method to study the determinants of stock market returns in Nigeria: A time series analysis between 1984 and 2010. They founds that interest rate, previous stock return levels, money supply and exchange rate are the main determinants of stock market returns in Nigeria. Using modified Error Correction Model Approach to examine the determinants of stock market development in Nigeria.

[18] In a study titled does monetary policy determine stock market liquidity? New evidence from the Euro zone used Panel and VAR models to sheds light on the actual impact of monetary policy on stock liquidity and thereby addresses its role as a determinant of commonality in liquidity. Results suggested that an expansionary monetary policy of the European Central Bank leads to an increase of aggregate stock market liquidity in the German, French and Italian markets. Furthermore, the effect of monetary policy is significantly stronger for smaller stocks, suggesting a non-linear impact of monetary policy on stock liquidity.

[19] Examined the dynamic linkages between monetary policy and the stock market during the three distinct monetary regimes of Burns, Volcker and Greenspan since the 1970s. Some major findings are the following. First, in the 1990s it appears that there was a disconnection between Federal Reserve actions (via the federal funds rate) and responses by the stock market. Second, the impact of inflation on the stock market did not surface as significant in the later parts of 1980s and the 1990s. And third, significant asymmetric effects of monetary policy on the stock markets were observed throughout each monetary regime but these were more pronounced during bear markets than bull markets. These results suggest that there was no consistent dynamic relationship between monetary policy and the stock market and that the nature of such dynamics was different in each of the three monetary regimes.

[20] Examined potential impacts of fiscal and monetary policies on stock market performance in Poland. Applying the GARCH model and based on a sample during 1999.Q2 to 2012.Q4. The paper found that Poland's stock market index is not affected by the ratio of government deficits or debt to GDP and is negatively influenced by the money market rate. The stock index and the ratio of M3 to GDP show a quadratic relationship with a critical value of 46.03%, suggesting that they have a positive relationship if the M3/GDP ratio is less than 46.03% and a negative relationship if the M3/GDP ratio is greater than 46.03%. Furthermore, Poland's stock index is positively associated with industrial production and stock market performance in Germany and the U.S. and negatively affected by the nominal effective exchange rate and the inflation rate.

[21] Estimated the response of stock prices to monetary policy shocks using time-varying coefficients VAR. Evidence points to protracted episodes in which stock prices end up increasing persistently in response to an exogenous tightening of monetary policy. That response is at odds with the conventional view on the effects of monetary policy on bubbles, as well as with the predictions of bubbleless models. The study argued that it is unlikely that such evidence can be accounted for by an endogenous response of the equity premium to the monetary policy shock.

[22] Investigated the impact of monetary policies on stock markets based on a sample of five open countries with growing stock market over the period 2004 to 2014. Using a random effect model for the panel regression coupled with a panel vector error correction model to study the short term and long term relationship between the variables, the findings revealed a negative relation between interest rate and stock return and a direct link between money supply and stock return. Results confirmed that both in the short run and long run monetary variables explain changes in stock return.

[23] Investigated the impact of monetary policy on stock returns in Nigeria over the period 2003:01-2014:06. The empirical investigation was conducted using a six variable standard VAR model with six lags which includes consumer price index (CPI), inter-bank rate (IBR), open buy-back (OBB), Treasury bill rate (TBR), exchange rate (XGR) and all share index (ASI). The dynamic interactions among the variables are based on variance decompositions and impulse response functions generated from the VAR. The estimated results revealed that monetary policy variables did not have a significant impact on the prices of stock in Nigerian equity market. The implication of this result is that the Nigerian equities market do not significantly absorbs the monetary policy impulses and as such cannot be taken as being a good transmission channel yet for monetary policy implementation.

[24] Investigated the relationship between the monetary policy instruments used by the Central Bank of Nigeria and stock market performance measured by the growth of market capitalization in the Nigerian Stock Exchange Market. Utilizing the method of DWLS Model, the study found out that monetary policy instruments such as Monetary Policy Rate, Treasury Bills, Direct Credit Control and Broad Money Supply, have long and short-run high impacts on stock market performance. This implies that, those variables have great effect (positively or negatively) on the Nigerian stock market. Findings also revealed that variations in market capitalization in the short run were also caused by the change in cash reserve ratio, liquidity ratio and exchange rate. The study suggests that, government through the monetary authority should be cautious enough to avoid discretionary policies that might hike the rate of interest; otherwise the flow of fund to the market will be derailed.

3. RESEARCH METHODS

3.1 Theoretical Framework

This study depends on [7] theoretical background of the role of monetary policy in explaining the stock market. [7] submitted that the present value or discounted cash flow model offers useful insights on the stock market effects of monetary policy changes. The detail of this model is presented below:

According to this widely used model the stock price (*St*) is the present value of expected future dividends (*Dt+j*). Under the assumption of constant discount rate (*R*), it can be shown that:

$$S_t = E_t\left[\sum_{j=1}^{K}\left(\frac{1}{1+R}\right)^j D_{t+j}\right] \quad (1)$$

where, *Et* is the conditional expectations operator based on information available to market participants at time *t*, *R* the rate of return used by market participants to discount future dividends, and *K* is the investor's time horizon (stock holding period). The standard transversality condition implies that as the horizon *K* increases the second term in the right-hand side of Eq. (1) vanishes to zero (no rational stock price bubbles):

$$\lim_{K\to\infty} E_t\left[\left(\frac{1}{1+R}\right)^K S_{t+K}\right] = 0 \quad (2)$$

Thus, we obtain the familiar version of the present value model:

$$S_t = E_t\left[\sum_{j=1}^{K}\left(\frac{1}{1+R}\right)^j D_{t+j}\right] \quad (3)$$

Eq. (3) indicates that a change in monetary policy can affect stock returns in a dual manner. First, there is a direct effect on stock returns by altering the discount rate used by market participants. Tighter monetary policy leads to an increase in the rate at which firms' future cash flows are capitalised causing stock prices to decline. The underlying assumptions are that, first, the discount factors used by market participants are generally linked to market rates of interest and second, the central bank is able to influence market interest rates [25]. Second,

monetary policy changes exert an indirect effect on the firms' stock value by altering expected future cash flows. Monetary policy easing is expected to increase the overall level of economic activity and the stock price responds in a positive manner (expecting higher cash flows in the future). Hence, this channel generally assumes the existence of a link between monetary policy and the aggregate real economy. As [5] argued, stocks are claims on future economic output, so if monetary policy has real economic effects then stock markets should be influenced by monetary conditions.

3.2 Model Specification and Data

The main objective of this study is to examine the relationship between monetary policy and stock market prices in Nigeria. For this purpose the model adapted for this study is predicated on the theoretical exposition of [7] and a modified model of [24]. The preferred model is represented as equation 4 below:

$$InASI = \beta_0 + \beta_1 InMPR + \beta_2 InCPS + \beta_3 InEXR + \beta_4 InBMS + \mu \quad (4)$$

Where: ASI = All Share Index, MPR = Monetary Policy Rate, CPS = Credit to Private Sector, Official Exchange Rate and Broad Money Supply. In = Natural logarithm, β_0 = the intercept or autonomous parameter estimate, $\beta_1 to \beta_4$ = Parameter estimate representing the coefficient of MPR, CPS, EXR and BMS respectively, and μ = Error term (or stochastic term). The a'priori' expectations are determined by the principles of economic theory and refer to the expected relationship between the explained variable and the explanatory variable(s). It is expected that $\beta_1 to \beta_4 > 0.$

For the necessity of uniformed scale of measurement and consistent interpretation of results, all variables were transformed to natural logarithms, which allow us to interpret the coefficients as elasticities.

The study depended on secondary data that were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin various issues, National Bureau of Statistics and World Development Indicators for Nigeria (WDI). It covers the period from 1981 to 2015.

3.3 Estimation Technique and Procedure

First, the variables employed in the study were investigated in order to determine their stochastic properties, and to facilitate the determination of the appropriate econometric framework used for analysis. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were used in the present study. The two tests were used to test for consistency and where conflicts exist, to decide on the most appropriate option [26].

The unit root tests are followed by the test of cointegration using [27,28] framework, in preference to [29] two-step approach, in that the former does not, a priori, assume the existence of at most a single cointegrating vector; instead the number of cointegrating relationships is tested. Moreover, as against the Engel-Granger procedure, which is sensitive to the choice of the dependent variable in the cointegrating regression, the Johansen framework assumes that all the variables in the cointegrating equation are endogenous [30]. Thereafter, the examination of the cointegrating growth equation is carried out. It must be emphasized that the existence of cointegration among a set of time series variables implies the existence of an adjustment mechanism. Although the use of the OLS estimator to generate the cointegrating regression is consistent, it is however fraught with the problem of non normal distribution, so that the results of statistical inferences are invalid when the usual tests are executed. It is therefore germane to employ appropriate estimators in order to overcome this problem. In the present study, the Dynamic Ordinary Least Squares (DOLS) estimator engineered by [13] and the Fully Modified Ordinary Least Squares (FMOLS), originally developed by [14] were adopted.

The DOLS approach is particularly useful because it introduces dynamics in the model specified while allowing for simultaneity bias. Thus the DOLS estimator of the cointegrating regression equation incorporates all variables in levels, in addition to leads and lags of values of the explanatory variables. To overcome the problem associated with the non-normal distribution of the standard errors of the cointegrating regression equation, the specified model was estimated by OLS using the [31] Heteroscedastic and Autocorrelation Consistent (HAC) covariance matrix estimator, whose standard errors are robust, ensuring the validity of the inferences about the coefficients of the

variables entering the regressors in levels. *Eviews 9.5* package was consequently employed to estimate the model by including 1 lead and 3 lags in the regressors. The lag selection was based on the Schwarz Bayesian Criterion (SBC). In like manner, the study employed the Fully Modified Ordinary Least Squares (FMOLS), a framework that provides optimal estimates of cointegrating regressions, and modifies least squares to account for serial correlation effects and for the endogeneity in the explanatory variables, when there is cointegration. The two frameworks thus help in dealing with validity of inference, serial correlation effects and the problem associated with endogeneity. Following [32] General to Specific (GETS) methodology, the parsimonious Dynamic OLS results are presented. The diagnostics include tests for autocorrelation, normality, heteroscedasticity and stability of estimated coefficients.

4. DATA ANALYSIS AND RESULTS

The results of the unit root tests (with trend and intercept) are presented in Table 1.

From Table 1, the traditional tests of ADF and PP indicate that all the variables tend to be stationary in first difference and are integrated at order one {that is I(1)}. At this order of integration, both ADF and PP test statistics are greater than their critical values. Since all the variables were found to be stationary at first difference (that is at order 1(I)), it was safe for the study to employ and proceed with Johansen co-integration test.

4.1 Co-integration Estimate

If two or more-time series are not stationary, it is important to test whether there is a linear combination of them that is stationary. Economically, variables are cointegrated if they have a long term, or equilibrium relationship between them. It is a pretest to avoid spurious regression situations. More so, [33] argued that where there are more than two variables in a model, there is a possibility that the emerging cointegrating vectors governing the joint evolution of all the series will be more than one. The Johansen Cointegration approach was adopted in this study. The results of the cointegraton tests are presented in Table 2.

Results in Table 2 suggested that there is a long-run equilibrium relationship among the variables of interest. The trace test statistics indicate that the hypothesis of no cointegration among the variables is rejected at the 5% significance level. From the results, there is at least one cointegrating vector based on the trace

Table 1. Traditional unit root test results (trend and intercept)

Variables	ADF	Critical values	Order of integration	PP	Critical values	Order of Integration
ASI	-5.270	-4.324*	I(1)	-6.242	-4.309*	I(1)
MPR	-6.865	-4.441*	I(1)	-6.952	-4.309*	I(1)
CPS	-4.669	-4.285*	I(1)	-8.750	-4.263*	I(1)
EXR	-5.196	-4.309*	I(1)	-5.186	-4.309*	I(1)
BMS	-4.844	-4.309	I(1)	-7.405	-4.309*	I(1)

*Note: * Indicates stationary at the 1% level, and ** Indicates stationary at 5% level*
Source: Researcher's computations using E-views 9.5

Table 2. Johansen cointegration test results

Trace Test k = 2				Maximum Eigenvalues Test k = 2			
H_0	H_A	(λ trace)	Critical values (5%)	H_0	H_A	(λ Max)	Critical values (5%)
$r \leq 0$	$r > 0$	82.36645*	69.81889	$r \leq 0$	$r > 0$	32.87540	33.87687
$r \leq 1$	$r > 1$	49.49105*	47.85613	$r \leq 1$	$r > 1$	26.14929	27.58434
$r \leq 2$	$r > 2$	23.34176	29.79707	$r \leq 2$	$r > 2$	12.37057	21.13162
$r \leq 3$	$r > 3$	10.97118	15.49471	$r \leq 3$	$r > 3$	9.980528	14.26460
$r \leq 4$	$r > 4$	0.990656	3.841466	$r \leq 4$	$r > 4$	0.990656	3.841466

Note: r represents number of co-integrating vectors and k represents the number of lags in the unrestricted VAR model.
** denotes rejection of null hypothesis at the 5% (1%) level.*
Source: Researcher's computations

test statistics. The existence of long-term equilibrium relationships among non-stationary variables precludes the results of spurious regression when the variables are used in levels for estimation purposes. Next, the study presents the estimated regression results from the DOLS and FMOLS.

The coefficient of monetary policy rate is positively related to stock market prices captured by the all share index in the DOLS frameworks and negative in the FMOLS frameworks. Consequently, a rise in monetary policy rate exerts a positive impact on stock market prices captured by the all share index in the DOLS frameworks and negative impact in the FMOLS frameworks. The coefficient is statistically insignificant in both frameworks. Here, it is noteworthy that results from the DOLS framework are not consistent with those of the FMOLS framework. This major difference on the role of monetary policy rate in influencing stock prices could be attributed to structural breaks in time series data. Structural breaks can be associated with a deliberate policy shift by government towards interest rate deregulation.

The coefficient of credit to private sector is negatively related to stock market prices captured by the all share index in the DOLS and positive in FMOLS frameworks. Consequently, a rise in credit to private sector exerts a negative impact on stock market prices captured by the all share index in the DOLS frameworks. The coefficient is statistically insignificant in both frameworks.

The exchange rate coefficient is directly related to stock market prices captured by the all share index and statistically significant at the 5% and 1% levels for the DOLS and FMOLS frameworks respectively. The implication of this is that exchange rate depreciation tends to enhance stock market performance.

The coefficient of broad money supply is positively related to stock market prices captured by the all share index in both the DOLS and FMOLS frameworks. Consequently, a rise in broad money supply exerts a positive impact on stock market prices captured by the all share index. The coefficient is statistically significant in DOLS framework and insignificant in FMOLS framework.

The goodness of fit of the DOLS estimate is adequate. About 99% variation in stock market prices is due to changes in the regressors. For the FMOLS estimates, the explanatory variables employed in the model account for about 94% changes in stock market prices.

4.2 Robustness Checks

The study provides a check for robustness of the estimated regression equation, using the general to specific framework developed by [31]. The uniqueness of ECM is that it provides the framework for establishing the link between the long and short run approaches to economic modelling [34]. With the ECM, no first difference information is lost because the ECM incorporates both the short run dynamics and long run information in the error correction term. A pre-estimation diagnostic indicates that there is presence of cointegration among the variables used (see Table 2). The result of the parsimonious or preferred ECM model is presented in Table 4.

Table 3. Regression results

Dependent variable: ASI						
Variable	**DOLS**			**FMOLS**		
	Coefficient	**Std. error**	**t-Statistic**	**Coefficient**	**Std. error**	**t-Statistic**
LOG(MPR)	1.119	0.786	1.423	-0.865	0.487	-1.776
LOG(CPS)	-0.194	0.420	-0.462	0.029	0.135	0.214
LOG(EXR)	1.140**	0.166	6.887	1.175*	0.071	16.529
LOG(BMS)	2.575**	0.816	3.155	0.377	0.393	0.958
C	-4.874	3.538	-1.378	5.184	1.951	2.657
R^2	0.99				0.94	
Adjusted R^2	0.95				0.93	
SER	0.389091				0.471183	
Long-run variance				0.003797	0.313880	

*Note: * and ** denote significant at the 1 and 5 percent level respectively.*
Source: Researcher's computations

Table 4. Summary of parsimonious (preferred) ECM result

Variables	Coefficients	t-values	p-values
C	**0.051**	**0.868**	**0.39**
DLOG(MPR)	-0.768**	-3.299	0.03
DLOG(CPS)	0.144	1.618	0.12
DLOG(EXR)	0.629**	3.393	0.03
DLOG(EXR(-1))	0.299	1.574	0.13
DLOG(BMS(-2))	-0.423**	-2.214	0.03
ECM(-1)	-0.236***	-1.769	0.09
JB=0.143881 (0.930586); BG [χ^2, 1]= 1.586332 (0.2306) ARCH (χ^2)= 0.861029 (0.3623)			

R^2 = *0.54, Adj.* R^2 *= 0.41, F. Statistic = 4.15, and DW = 1.5*
*Note: ** and *** represent 5% and 10% level of significance respectively. Probability values are in parenthesis.*
JB: Jarque-Bera test for normality of residuals;
BG: Breusch-Godfrey Serial Correlation LM Test and
ARCH: Engle's test for conditional heteroskedasticity.
Source: Researcher's computations

As expected, the lagged error correction term is negative and statistically significant at 10 percent level. Since, the coefficient of the lagged error correction term is negative and significant; the coefficient reveals the speed at which the entire system adjusts towards long-run equilibrium. The coefficient of ECM is (-0.24) which shows speed of adjustment from short run fluctuations to long run equilibrium (24% discrepancy is corrected each year) approximately to 24 percent of disequilibrium from the previous year's shock convergence back to the long run equilibrium in the current year.

From Table 4, credit to private sector exchange rate and one period lagged exchange rate are positively related to stock market prices and exchange rate is statistically significant at the conventional levels, with the exemption of monetary policy rate and broad money supply that are negatively related. Monetary policy rate and broad money supply have a negative relationship with stock market prices and statistically significant.

Furthermore, the model R-squared and Adjusted R-squared are 0.54 and 0.41, respectively, thus, indicating that over 54 per cent of the variation in the dependent variable is explained by changes in the explanatory variables. The F-statistic (4.15), which measures the overall significant of the model, was equally high; while the Durbin-Watson statistic is 1.5 (D-W ≈ 2) suggests that autocorrelation is unlikely to be a problem.

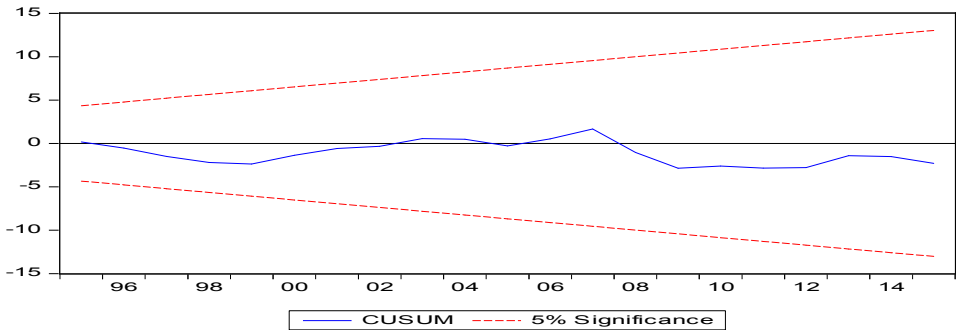

Fig. 1. Cumulative sum of squared residuals (CUSUM) test
Source: Researcher's plot using E-views 9.5

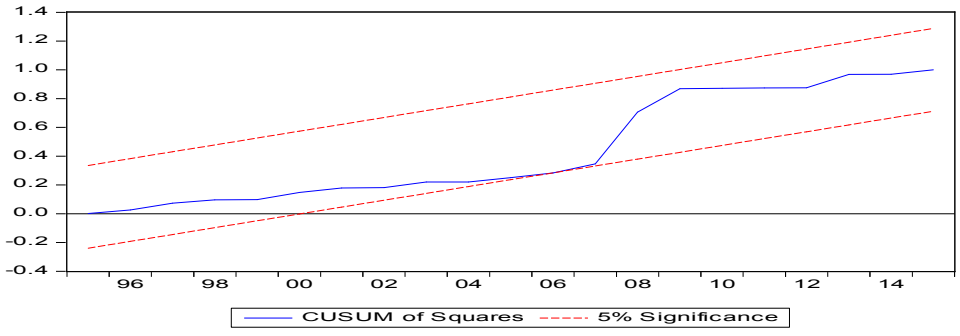

Fig. 2. Cumulative sum of squared residuals (CUSUM of squares) test
Source: Researcher's plot using E-views 9.5

Consequently, the estimated model is confidently relied upon for making inferences and for prediction purpose as utilized in this study. In addition, the ECM model satisfies the conditions of normaility (JB), autocorellation (GB), and heteroscedasticity (ARCH).

From Figs. 1 and 2, both the CUSUM and CUSUMSQ plots are within expected bounds at 5% significance level, as they do not cross the 5% critical lines. The implication of this is that the estimated coefficients are stable over the entire sample period of investigation. Thus, the regression coefficients are appropriate for policy.

5. CONCLUSION AND RECOMMENDATIONS

The paper investigated the relationship between monetary policy and stock market prices in Nigeria and through that assess whether monetary policy influences stock market prices, for the period 1985 to 2015. The Dynamic and Fully Modified Ordinary Least Squares (DOLS and FMOLS) techniques were used for the analysis, while the error correction model (ECM) framework was deployed for robustness.

A long-run equilibrium relationship was found among the variables used, namely all share index, monetary policy rate, credit to private sector, exchange rate and broad money supply. The empirical results indicate that on one hand, monetary policy rate, credit to private sector, exchange rate and broad money supply are positively related to stock market prices captured by the all share index in either the DOLS or FMOLS frameworks. Exchange rate and broad money supply were found to have statistically significant impact on stock market prices. The estimated ECM equations showed that the short-run determinants of stock prices are largely from are credit to private sector, exchange rate and one period lagged exchange rate; while monetary policy rate and broad money supply have a negative relationship with stock market prices. It is therefore evident from the result of this study that some monetary policy instruments like credit to private sector and exchange rate can be a better predictor of stock market prices in Nigeria. In summary, findings are consistent with the hypothesis that the monetary instruments have a significant effect in achieving improvement particularly on stock market index.

In the light of this, it is recommended that government through the monetary authorities should be cautious enough to avoid discretionary policies that might hike the rate of interest; as monetary policy rate through the interest rate channel has a negative relationship with stock market prices. Otherwise the flow of fund to the market will be derailed. Also, the government should fine turned the exchange rate policy and institute a consistent policy plan to mobilize surplus funds from abroad, which would be injected into the capital market for significant development.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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