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MONETARY POLICY AND STOCK PRICE BEHAVIOUR OF BANKS IN NIGERIA: A PANEL DYNAMIC CO-INTEGRATION APPROACH

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ABSTRACT

This study was conducted to examine effect of monetary policy on stock prices of listed banks in Nigeria. Specifically, the study examined effects of broad money supply, Treasury bill rate, monetary policy rate, exchange rate, cash reserve ratio, lending rate and savings deposit rate on stock prices of 15 listed banks on the Nigerian Stock Exchange as at 31st December, 2019. The study employed descriptive statistics, panel dynamic ordinary least squares and panel causality analysis to analyze quarterly data of stock price (STP) and monetary policy variables from 2006 to 2019. Results of the panel dynamic ordinary least squares (PDOLS) show that for banks, broad money supply (M2), monetary policy rate (MPR), exchange rate (EXCH) and interest on savings (SDR) significantly affect stock price negatively (p = 0.0147; p = 0.0000; p = 0.0110 and p = 0.0003 for M2, MPR, EXCH and SDR respectively). Treasury bill rate (TBR) significantly affects stock price positively (p = 0.0000) while cash reserve ratio (CRR) and lending rate (LDR) have insignificant effect on stock prices of banks. We recommend that Nigerian banks should be more pro-active in managing effects of monetary policy announcements to avert prolonged negative effects of such policies on their stock prices. We also advocate a re-appraisal of MP tools vis-à-vis stock market expansion goal by the Central Bank of Nigeria.

Keywords: Monetary Policy, Stock Price, Panel Dynamic OLS, Panel Causality.

INTRODUCTION

Generally, monetary policy (hereafter, MP) provides tools for macroeconomic management under the control of the Central Banks and are designed to achieve specific government economic objectives. MP aims at achieving certain national economic goals which historically include full employment (or a low unemployment rate); high output (or a high output growth); stable price level (or a low inflation rate); and a stable exchange rate and favourable balance of payments (BOP) position. These are often referred to as the ultimate goals of MP which are usually achieved indirectly by monetary authorities (Central Banks) through specially selected MP tools. These instruments, though different from country to country, usually include open market operations (OMO), discount/bank rate (both of which determine the monetary base), and required reserves, that is, the minimum reserves the commercial banks must hold against the public's deposit with them (CBN, 2011).

The pivotal role played by stock markets in economic development of any country necessitates that a great deal of attention is placed on its activities. Similarly, the reaction and sensitivity of other economic parameters to MP announcements compel researchers to continuously examine the impacts of such MP measures on other economic variables. Recognizing the connection between monetary policies visa-vis asset prices is crucial in gaining an enhanced understanding of the MP transmission mechanism as most changes in stock prices play a key role in several channels (Ioannidis & Kontonikas, 2006).

The question of whether Central Banks need to constantly respond to fall in stock prices by altering lending and other money market rates has been hotly debated. The first school, well represented in Bernanke and Gertler (2001); Schwartz (2002), and later Greenspan (2007), argued that Central Banks should avoid using interest rate in particular to influence stock prices. The thoughts here are: One, it is hard to recognize stock price changes before they occur (so intervention can only be feasible when such changes occur, and they significantly differ from expectations). Two, the school argues that even if such changes can be spotted *ex ante*, theses rates cannot be effective tools in addressing volatile stock price movements. The Central Banks can only limit the adverse effect once such changes occur. Again, this school posits that if inflation is lowered, Central Banks can endear sustainable economic growth in which stock price bubbles may not occur.

On contrary, the second school differs from this position (Cecchetti et al., 2000; Borio & White, 2004, Bordo & Jeanne, 2002; Roubini, 2006). This school believes that stock prices, often, are susceptible to crashes which can have strong pro-cyclical effects on financial market such as making it unstable. Hence, since Central Banks are expected to maintain financial sector and market stability, part of their duties should be to monitor stock prices and counter anticipated negative bubbles and crashes. This school sees money market rates as effective tools to combat stock price bubbles. It further posits that Central Banks ought to focus a particular stock price (like it does for inflation rate) to work towards it.

The nexus between MP measures and stock prices of banks in Nigeria is the focus of this study. Abaenewe and Undugbu (2012) argued that though, monetary policies are implemented through financial institutions of which includes the stock market, the high liquidity generated on daily basis at the stock exchange has made the Central Bank and other stakeholders on money market issues believe that economic stability can be achieved faster through capital market oriented monetary policies. Existing empirical works, to some extent, agree with the argument that a tight MP decreases stock prices while expansionary MP increases it (Ioannidis & Kontonikas, 2006; Bissoon et al., 2016). Further reviews of literature indicate presence of mixed empirical results. That response, according to these authors, clearly contrasts with the general view on how MP affects stock market bubbles, and also with the predictions of models without bubbles. Similarly, the authors posit that it is unlikely that such evidence is accounted for by an endogenous reaction of stock premium to MP shocks.

Expectedly, there has been controversy on significance and relevance of MP to stock prices. While some studies reveal that there is significant connection between alterations of MP variables and stock prices (Bissoon et a.l, 2016; Stoica & Diaconasu, 2012; Eze, 2011; Vithessonthi, & Techarongrojwong, 2012), others found no link between them (Kandir, 2008). Pai and Garg (2019) stated that further and regular studies on relation of stock price to monetary policies are imperative in that the knowledge of the magnitude and direction of these effects would be beneficial to both monetary authorities and investors. Monetary authorities will be able to design and implement appropriate policies that will have positive effects on stock market. Also, investors will be able to accurately calculate the intrinsic stock value in order to ascertain whether the stocks are over/under valued at market price, thus helping them identify which stocks to sell/buy to make profit.

Empirical literature that attempts to examine the relationship between monetary policy and stock prices in Nigeria have either focused on aggregate stock price (the All Share Indices) or assumed that all the banks listed on the stock exchange are subject to the same industry characteristics. Our present study concentrates on the effect of monetary policy on the stock prices of banks that are listed on the Nigerian Stock Exchange only, taking cognizance of firm differences by deviating from the conventional analysis of Time Series data to using panel data of individual firms. The specific objectives of the study, therefore, are to:

- i. examine effects of monetary policy on stock prices of deposit money banks in Nigeria; and,
- ii. ascertain the existence and nature of causal relationship between monetary policy variables and stock prices of deposit money banks in Nigeria.

This study used convenience sampling by taking all the 15 "deposit money banks" (DMBs) that are listed on NSE as of December, 2019. Deposit money banks are the intermediaries through monetary policy announcements by the CBN are executed while most monetary policy variables are targeted at growing the real economic sector. For convenience purpose the study covers 2006Q1 to 2019Q4. The span of years chosen is determined by data availability on one part and need to restrict the analysis of data obtained to the era of post-consolidation of the Nigeria banking sector, on the other. The dependent variable, stock price, is estimated as the quarterly average of monthly opening and closing stock prices for each firm under study. The variables representing MP are broad money supply (MS2), MP rate (MPR), lending rate (LDR), exchange rate (EXCH), cash reserve ratio (CRR), savings deposit ratio (SDR) and Treasury Bill rate (TBR). The deposit money banks selected include Access Bank, First Bank, Diamond Bank (now merged with Access Bank), First City Monument Bank, United Bank for Africa, Union Bank, Fidelity Bank, GTB, Unity Bank, Wema Bank, Sterling Bank, Stanbic IBTC, Ecobank, Zenith Bank and Skye Bank (now Polaris Bank).

LITERATURE REVIEW

Monetary Policy

In defining monetary policy (MP) based on its goals, McConnell et al. (2018) stated that it entails increasing the money supply during economic recession to stimulate spending and, conversely, restricting the money supply during inflation to constrain spending. CBN (2011) stated that need to control money supply is based on the general belief that there is relatively steady relationship between quantity of money supply and economic indicators, and that if the supply of money is not within what is needed to foster productive efforts, unwanted effects in form of inflation and/or deflation may occur.

There are varied determinants that can influence money supply, some of which can be controlled by CBN, while there are others outside its purview. The specific objectives and focus of MP may vary over time, depending on level of country's economic development and fortunes. Nonetheless, MP variables such as changes in the discount rate may have, at best, an indirect effect on these variables and considerable lags are involved in the policy transmission mechanism. The macroeconomic objectives of MP to include: maintenance of relative stability of domestic prices; attainment of full employment or reduction in unemployment rate; achievement of rapid and sustainable economic development; maintaining balance of payment equilibrium; and stabilizing exchange rate.

Emmanuel and Kwabla-Djre (2012) stated that MP has both operational and intermediate targets. The operational goal of MP is an economic variable which Central Bank controls on through use of MP instruments, while intermediate target is an economic variable controllable by it with time lag and precision which is relatively stable or has, at least, predictable association with the MP goals. Examples of MP intermediate targets are money supply, interest rate, exchange rate etc. Furthermore, Emmanuel and Kwabla-Djire (2012) posited that the efficient conduct of MP is a major responsibility of a country's Central Bank that it pursues to influence macroeconomic variables towards achieving external and internal economic stability. However, according to these authors, MP is usually confronted with the challenge of managing excess liquidity, rapid expansion in credit and excess foreign exchange and capital inflows. Also, developing economies are usually confronted with liquidity shortage and inflationary pressure which results from overheating of the economy, effective MP tends to curb this problem.

Stock Price and Its Behaviour

Okech and Mugambi (2016) stated that stock price is the gain or loss of value of a stock in particular period which is made up of capital gains plus all incomes accruing to the investor from the stock. Since stock prices portray how well such stocks are doing in market, stock market indexing is a widely used measure of stock performance. The measures of stock performance include capitalization a measure market size and liquidity that refers to the capability of investors to trade securities. Others include All Share Index (ASI), a reflection of performance and condition of stock market; turnover ratio, an index of comparison of market liquidity rating with transaction costs (Daferighe & Sunday, 2012). According to Kuçukkocaoglu and Unalmıs (2013), measurement stock price reaction to MP is complicated due to endogeneity and omitted variables bias problems. These authors argue that to overcome these problems, the most commonly adopted estimation method is the event study (ES) approach. This method basically compares equity prices immediately before and after announcements and qualifies such changes to MP shocks (Rigobon & Sack, 2004)). However, Rigobon and Sack (2004) argued that stock prices do not actually react to policy announcements per se, rather it reacts to the unexpected component not already market-priced. This is the position of EMH which posits that all available market information should be reflected in stock prices all the time.

Theoretical Review

There are several theories underlining the behaviour of stock prices in the stock market. French (2003) stated that the CAPM was developed by Markowitz (1952) as a model for evaluating assets returns in given combination of securities (portfolio) but was built upon by later theorists. Tobin (1958), Sharpe (1963), Lintner (1965) and Mossin (1966) made further simplifications and into the model. The CAPM states that expected stock return by investors is usually a function of risk-free rate and risk premium dictated by the market. This indicates that expected returns on asset is the risk-free rate plus market risk premium. Sharpe's (1964) modification to the model recognizes two components of risks: systematic (uncontrollable, non-diversifiable) and unsystematic (controllable, diversifiable). The systematic risk also affects stock return and price, hence, an important factor to be considered in pricing of stocks. Sharpe (1964) develops concept of efficient frontier on which all investors will hold some portfolio, irrespective of their dispositions to risks. Hence, to have an efficient portfolio, an investor can hold a portfolio of risk-free plus risky assets situated at the point of intersection of capital market line (CML) and efficient frontier. A basic assumption here is that the CML entails all possible combination of risky and risk-free investments that all investors will consider for investment. According to Sharpe (1964), efficient portfolio is when, in capital market, investors cannot expect returns greater than market returns.

Yoshino et al. (2014) restated the Keynes' "beauty contest" effect approach (model) to stock pricing. This theory posits that investors take decision on demand for stock by first forecasting future pay-outs from the stock, then guess other investors' forecast and others' forecasts of others' forecasts. This process continues to the last potential investor's forecast. Towsend (1983) used a broad framework while Basak (2000) used stock market context to theoretically show that personal expectation and others' expectations cause more stock price volatility than rational judgment. However, basing one's investment decision on what others expect from the market may sometimes mislead.

Empirical Review

In a study conducted by Megaravalli and Sampagnaro (2018) to examine short-run and long-run link between macroeconomic variable and stock returns in China, Japan and India, findings show that though exchange rate positively impacts stock price in these countries on long-run, no significant connection exist between stock price and macroeconomic variables in short-run. These results were achieved through test of co-integration, causality test and pooled mean group estimator. More specifically, Picha (2017) examined impact of money supply on stock index as captured by Standard and Poors (S&P) in USA using the portfolio balance MP transmission channel. The author analyses a Time Series data of four variables: S&P performance rating, deposits and currency, treasury value and equity value from 1952 to 2015 with the VECM and co-integration for short and longterm relationship respectively. Results reveal that long-run wise; MP variables positively influence S&P rating.

Bissoon et al. (2016) examined how monetary policies impact stock markets of countries in both developed and the emerging economies. The authors use random effect model (REM) for panel regression and panel vector error correction model (PVECM) to study short- and long-term relationships between variables in five open economies with developing stock market (Mauritius, Australia, London, Japan and Trinidad) from 2004 to 2014. The study reveals an inverse linkage of interest rate with stock return but direct (positive) link between broad money and stock prices. The results support the position that MP variables explain stock price changes in both short- and long-run. Sun and Liu (2016) examined different effects of MP actions and Central Bank's announcements on China's stock market variations with SVAR model with stochastic volatility. The authors observe that MP actions as incapable of effectively regulating rising stock prices during volatile bubbles.

Linking Spanish interest rates movements and stock price from industry perspective, Moya et al. (2013) used a wavelet-based framework and observe that in Spain, stock market reflects a considerable level of exposure in interest rate. However, the authors find that cross-industry and time horizon differences exist in such exposures. For example, prices of regulated industries (utilities, real estate, utilities, food, beverages and banks) are more sensitive to interest rates than the less regulated industries. Furthermore, it was discovered that less regulated industries (construction, chemicals and paper, health, automobiles) hardly get exposed to interest rates risk.

Pai and Garg (2019) studied how the India stock market respond to macroeconomic surprises. The researchers analyze how sensitive Indian stock market indices are to MP (Treasury bill rates, interest rates, cash ratio) and fiscal policy (GDP, industrial production index, account deficit) variables using event study and the VAR. Results of event study show that MP exerts significant effect on stock prices more than other macroeconomic variables while VAR result show that both monetary and fiscal policies significant influence stock prices of Indian firms. Still in India, Kumari and Jha (2019) evaluated effect of cash reserve ratio and reverse repo rate (as instruments of MP) on Indian stock index – closing price of NIFTY 50 (a metric of stock market growth) using multiple linear regression and Pearson's correlation analysis. Both analytical techniques reveal that there is no statistically significant relationship between reserve and repo rates and stock price in India.

Ho and Odhiambo (2018) used ARDL technique to analyse effect of macroeconomic determinants of stock behaviours in Philippines for duration 2001Q4–2016Q4. The authors specifically investigate long-run nexus between Philippines' capital market and selected macro-variables namely: trade openness, banking sector development, inflation, foreign exchange rate, stock market liquidity and economic growth. While the authors find, in short-run, that trade openness is negatively associated with capital market development, banking sector development and exchange rate positively influenced it. Badullahewage (2018) found that in Sri Lanka, interest, foreign exchange and GDP positively and significantly affect stock price while broad money exerts negative but significant effect on it. To arrive at this conclusion, the author studies impact of macroeconomic variables on stock price of firms listed on Colombo Stock Exchange with

regression analysis. Ahmed et al. (2018) observed, in Pakistani, that there exists no long-or short-run relationship between macroeconomic indicators and stock price during 1993 to 2017 period.

Kuçukkocaoglu and Unalmiş (2013) investigated impact of MP Committee announcements on banks' stock returns in Turkey using GMM technique to analyze data of 16 Turkish banks for the period 2005 to 2013 based on 99 policy announcements. The GMM technique recognizes both the simultaneity and the omitted variables problems. The researchers find that, in traditional policy episode of traditional inflation targeting, increases in policy rate on Monetary Policy Committee announcements lead to significant declines in stock returns of all individual banks. Further, while comparing these results with the more widely applied event study method, the researchers find that event study gives biased results for most of bank stock returns and that there is heterogeneity in responses of bank indices to MP committee announcements surprises for traditional MP episode. According to the study, domestically owned deposit banks are among the most affected. It revealed further that the bank specific ratios related to banks' interest payments and receipts are important determinants of degree of heterogeneity. For example, banks' stock returns which are dependent on money market funding and make considerable share in balance sheets respond more aggressively to the changes in policy rates, whereas the stock returns of banks with higher net interest income respond less to MP.

Yola (2019) assesses reactions of indices of NSE to innovations in nation's MP using EGARCH augmented model. In what the author terms new evidence, it reveals that the effect of MP announcements on stock market indices is positive and significant. In examining effect of fiscal and MP variables on stock market interaction in Nigeria, Ayopo et al. (2018) used ARDL and E-GARCH econometric techniques to analyse effect of monetary variables (money supply, lending and exchange rate) among other fiscal policy variables on share index (ASI). The authors find that while lending and exchange rate have positive and significant effect on ASI, money supply has a negative and significant effect on it. Adeniji et al. (2018) empirically examined effect of MP shocks on volatility of stock prices of listed firms in Nigeria for period June 1999 – December 2016 with ARDL and EGARCH models. The authors find that interest rate positively

and significantly influences changes in stock price in short and long run while narrow money (M1) only positively affects stock price volatility in short run. Stock price movement indicates development in stock market. For instance, it is taken that increases in prices of stock is an indication that, significantly, stock market is healthy.

Oniore and Akatugba (2017) investigated the nexus of MP and stock prices on the NSE. The study assesses whether MP affect stock prices, for period 1985 to 2015 using Dynamic and Fully Modified Ordinary Least Squares (DOLS and FMOLS) techniques. The researchers find a long-run equilibrium between MP variables and stock prices. Specifically, it was discovered that MP rate, private sector credit, Naira/Dollar rate and M2 have positive influence on ASI using both DOLS and FMOLS frameworks. M2 and exchange rate significantly impact stock price. The estimated error correction equations show that the short-run determinants of ASI are largely credit to private sector, nominal forex rate and one-period lagged exchange rate; while MP rate and M2 have negative influence on ASI.

METHODOLOGY

Theoretical Framework and Model Specification

This study is premised on "quantity theory of money" by Friedman (1956) which holds that monetary phenomenon affect macroeconomic indicators, including share prices. This theory is also affirmed by Bissoon, et al. (2016) that the quantity theory of money validates the relation between money supply and stock prices. It is expected that when supply of money increases, there will be excess money that will spur investors to invest more in equity and cause increase in share prices.

The research developed panel data model by building upon existing empirical models to investigate the relationship between MP and stock prices of selected manufacturing firms and banking institutions in Nigeria. The study employed techniques of analyzing panel data to ascertain effect selected MP variables on the stock prices of manufacturing and banking firms that are listed on the Nigeria Stock Exchange. The model for this study is an adaptation of the one used by Oniore and Akatugba (2017) in their study on impact of MP on stock market prices in Nigeria. Whereas their model captures MP rate, credit to private sector, exchange rate and broad money as variables for MP and ASI as representation for stock prices, this study modified their model by increasing number of MP variables and using individual firm's stock prices in place of the ASI. This is to address the gap that motivated this study: examining how differences in how MP affects stock prices of banks. Oniore and Akatugba (2017) model is hereby restated:

ASI = (MPR; CPS; EXC; BMS)(1) Where ASI = All Share Index MPR = MP Rate CPS = Credit to Private Sector, and BMS = Broad Money Supply

Model (1) is modified in this study because it uses aggregate stock price for all firms listed on the NSE. This study modified the model to include a panel data of selected firms and is expressed functionally as:

model specification for this study are as follows:

where:

 STP_{Bi} = Quarterly average (of monthly opening and closing) stock prices of banking firms.

 $\alpha_0 \beta_1 \dots \beta_7 = \text{Regression parameters}$

i = Time (Quarterly)

ln = Natural logarithms

 $\varepsilon =$ Stochastic Error Term

Estimation Techniques

The study conducted some pre-estimation tests which include descriptive statistics that reveal the statistical properties of all variables, correlation test, test of unit root (stationarity) and co-integration tests. The statistical properties of each of selected variables include the mean, median, maximum, minimum, coefficients and direction of skewness, kurtosis and Jarque Bera test of normal distribution. The correlations matrix was also estimated while the Fisher – Augmented Dickey Fuller (Fisher-ADF) panel data stationary test was used to ascertain the order of stationarity for each variable under study. Furthermore, to determine if there exists a relationship between MP variables and stock prices, the Johansen-Fisher combined (Trace and Max-Eigen) co-integration test was to test for long-run relationship between the variables.

We used the Panel Dynamic Ordinary Least Squares (DOLS) technique is used to find long-run relationship existing between dependent and explanatory variables. The general DOLS model in respect of this study is expressed as:

$$logSTP_{Ri} = \alpha_{O} + \beta_{I}logM2 + \beta_{2}logTBR + \beta_{3}logMPR + \beta_{4}logEXCH + \beta_{5}logCRR + \beta_{6}logLDR + \beta_{7}logSDR + q q q + \sum_{\beta_{Icj}\Delta logM2_{ct}} + \sum_{\beta_{2}c_{j}\Delta logTBR_{c,t+j}} + \sum_{\beta_{3}c_{j}\Delta logMPR_{C,t2+J}} + j_{=-p} j_{=-p} j_{=-p} p p p p p p p p p p p j_{=-p} j_{=-p} j_{=-p} j_{=-p} j_{=-p} j_{=-p} p p j_{=-p} j_{=-p} j_{=-p} j_{=-p} j_{=-p} p p j_{=-p} j$$

From equation (4), $\beta_1 cj \dots \beta_s cj$ are the coefficients of lead and lag q and p respectively differences that estimate unbiased estimates of $\beta_1 \dots \beta_s$ and remove asymptotic endogeneity and incidence of serial correlation or multi-collinearity (Kao & Chiang, 2000).

Finally, to ascertain if there exists causal relationship between MP variables and stock prices of listed banks in Nigeria, this research used stacked data test (common coefficients) panel causality test. This test assumes that all coefficients are homogeneous across all cross-sections. It is hypothetically expected that increase in M2 can have either positive or negative effect on STP while increase in TPR, MPR, EXCH, LDR, SDR and CRR will all have negative effect on STP.

RESULTS AND DISCUSSIONS OF FINDINGS

Preliminary Tests

The analysis carried out here is meant to address the first objective of this research, which is to ascertain the relationship between MP and stock prices of banking firms quoted on the NSE during study period.

(a) Descriptive Statistics

Table 1 contains the abridged descriptive statistics of banking firms panel data analyzed in this study.

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Banks
Statistics –
Descriptive

Table 1								
Descriptive Sta	tistics – Banks							
	STP	M2	TBR	MPR	EXCH	CRR	LDR	SDR
Mean	10.16653	13.60282	9.446034	11.17982	179.6677	11.29441	16.77441	2.642570
Maximum	53.24300	24.14000	19.97000	14.00000	306.7127	31.00000	31.18000	4.220000
Minimum	0.50000	2.910000	1.710000	6.00000	117.7449	1.000000	8.000000	0.000000
Skewness	1.696434	0.017240	0.034275	-0.742976	1.240926	0.387085	0.765738	-0.684886
Kurtosis	5.549696	1.870344	2.791498	2.373971	2.992037	1.714504	2.306885	2.221810
Jarque-Bera	537.3729	38.10644	11.437135	77.56572	183.7631	67.17989	84.30377	74.04197
Probability	0.064405	0.00000	0.487450	0.070032	0.000000	0.000000	0.000000	0.8325000
Observations	840	840	840	840	840	840	840	840
Source: Author's C	omputation (202	2)						

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Table 1 shows that on average STP, M2, TBR, MPR, EXCH, CRR, LDR and SDR is N10.16653, 13.60282(trn), 9.446034%, 11.17982%, N179.6677, 11.29441%, 16.77441% and 2.642570% for banking firms respectively for period under consideration. While the maximum stock price for the period is N53.24300, maximum values for M2, TBR, MPR, EXCH, CRR, LDR and SDR are 24.14, 19.97, 14, 306.7127, 31, 31.18 and 4.22 respectively. Inversely, the minimum values for STP, M2, TBR, MPR, EXCH, CRR, LDR and SDR are 0.5, 2.91, 1.71, 6, 117.7449, 1, 8 and 0 respectively. The coefficient of skewness of study variables reveals that two of the variables, MPR and SDR are skewed to the left of the distribution with coefficients -0.742976 and -0.684886 while STP, M2, TBR, EXCH, CRR and LDR are all skewed to the right with coefficients 1.696434, 0.01724, 0.034275, 1.240926, 0.387085 and 0.765738 respectively. Only STP is leptokurtic with kurtosis above given benchmark of 3 while M2, MPR, EXCH, CRR, LDR and SDR are all platykurtic having kurtosis below 3. TBR and EXCH are approximately 3. Four out of seven variables (STP, TBR, MPR and SDR) are normally distributed with Jarque-Bera coefficients and probabilities [(537.3729 (0.064405); 11.437135 (0.487450); 77.56572 (0.070032) and 74.04197 (0.8325000)] respectively. The other variables (M2, EXCH, CRR and LDR) are not normally distributed due to their Jarque-Bera coefficients and probabilities [(38.10644 (0.000000); 183.7631 (0.000000); 67.17989 (0.000000) and 84.30377 (0.000000)] respectively.

(b) Correlations - Banks

Table 2 shows the correlations among all variables under consideration

	STP	M2	TBR	MPR	EXCH	CRR	LDR	SDR
STP	1.00000							
M2	-0.195124	1.00000						
TBR	-0.075658	0.563630	1.00000					
MPR	-0.061495	0.518106	0.758351	1.000000				
EXCH	-0.118496	0.857598	0.597999	0.569292	1.000000			
CRR	-0.141545	0.890468	0.631084	0.735859	0.794711	1.00000		
LDR	-0.012466	0.607908	0.597232	0.713809	0.835976	0.713070	1.00000	
SDR	-0.089095	0.452906	0.380247	0.442575	0.591256	0.601558	0.696037	1.000000
Source: Auth	or's Computation	(2021)						

Correlations Matrix for Banks' Data

Table 2

From Table 2, it is revealed that the coefficients of correlation between STP and independent variables are negative and weak, implying that the there exists no strong co-movement to the same direction between them. All the coefficients are between 1 (EXCH) and 20% (M2). However, there are considerable positive correlation coefficients among independent variables (between 38% for SDR/TBR and 89% for CRR/M2). This is expected as MP variables tend to move in same direction except for SDR. Nonetheless, if correlations coefficients fall below 0.8 among most variables analyzed, multi-collinearity issue could be overlooked.

(c) Test of Stationarity – Banks

The Fisher – Augmented Dickey Fuller (Fisher-ADF) panel unit root test is used to ascertain the level at which each variable selected is stationary. Table 3 contains summary of Fisher-ADF stationarity test for dependent and independent variables

Table 3

Variable	Leve	15%	First Diffe	rence 5%	Order of
	Fisher-ADF	Probability	Fisher-ADF	Probability	Stationarity
	Statistic		Statistic		
STP	103.812	0.6481	261.112	0.0000	I(I)
M2	113.099	0.6595	266.841	0.0000	I(I)
TBR	117.931	0.5363	213.080	0.0000	I(I)
MPR	67.1104	1.0000	203.711	0.0000	I(I)
EXCH	30.3238	1.0000	234.006	0.0000	I(I)
CRR	75.5351	0.9995	391.237	0.0000	I(I)
LDR	50.8400	1.0000	415.778	0.0000	I(I)
SDR	106.970	0.7968	671.684	0.0000	I(I)

Abridged Results of Stationarity Tests for Banks

Source: Author's Computation (2022)

Table 3 reveals that no variable is stationary at level and that all employed variables are stationary at first difference, that is, a null hypothesis that used variables have unit root cannot be accepted at order 1. These results provide the premise upon which the choice of estimation technique is made.

(d) Panel Cointegration Test – Banks

The Johansen – Fisher combined (Trace and Max-Eigen) cointegration test is employed in this study to ascertain if there exist at least one

cointegrating equation between stock price and MP variables. Table 4 summarizes results of these tests. Results of panel cointegration tests on the Table show a presence of long-run relationship between MP and stock prices of quoted banks in Nigeria. The rule for decision in co-integration test is to compare both Trace and Max-Eigen statistics with the critical values of each variables studied and accept null hypothesis that no cointegration exists is that these statistics are less than their critical values. Alternatively, the probability of each statistic is compared to significance level (5%) to determine whether not to accept or reject null hypothesis.

Table 4

Panel Cointegration Test

Johansen Fisher Panel Cointegration Test Series: STP M2 TBR MPR EXCH CRR LDR SDR

Sample: 2006 2019

Included observations: 840

Trend assumption: Linear deterministic trend

Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue) Hypothesized Fisher Stat * Fisher Stat *

Jr				
N COE()		D 1	(from max-	D 1
No. of $CE(s)$	(from trace test)	Prob.	eigen test)	Prob.
None*	379.9	0.0000	360.8	0.0000
At most 1*	163.6	0.0007	163.6	0.0007
At most 2*	156.5	0.0025	156.3	0.0025
At most 3*	217.7	0.0000	217.7	0.0000
At most 4*	211.1	0.0000	211.1	0.0000
At most 5*	181.5	0.0000	181.5	0.0000
At most 6*	194.9	0.0000	194.9	0.0000
At most 7	101.0	0.7185	101.0	0.7185
Trace and M	lax-eigenvalue tes	t indicate	at least 6 cointe	egrating eqn(s)
* de	enotes rejection of	the hypot	hesis at the 0.05	5 level
* Probabiliti	es are computed u	sing asym	ptotic Chi-squa	re distribution

Source: Author's Computation (2022)

From Table 4, the probabilities of both Trace and Max-Eigen statistics indicate at least 6 (six) co-integrating equations among variables selected for the study which are 0.0000, 0.0007, 0.0025, 0.0000,

0.0000, 0.0000 and 0.0000 for model equations respectively. The null hypothesis of no cointegration cannot be accepted.

Relationship between MP and Stock Prices with PDOLS

Having established stationarity order and presence of six cointegrating equations among variables used, it is safe to proceed to examine the relationship that exists between MP variables and stock prices of Nigerian banking firms for selected years. Given the data used in this research (panel dynamic data), the Dynamic Least Squares (DOLS) technique is used to ascertain long-run relation between dependent (stock prices) and explanatory variables (MP variables). One advantage of DOLS as being efficient had earlier been stated (Stojkoski & Popova, 2017). Table 5 contains results of cointegration regression (DOLS) for the banking firms' data.

Table 5

	Panel	Dynamic	Least	Squares	Results
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Dependent Variable: STP						
Method: Panel Dynamic Least Squares (DOLS)						
Sample: 2006 2019						
Periods include	ed: 14					
Cross-sections	included: 60					
Total panel (unbalanced) observations: 816						
Panel method: Pooled estimation						
Cointegrating equation deterministics: C @TREND						
Static OLS leads and lags specification						
Coefficient covariance computed using default method						
Long-run variance (Bartlett kernel, Newey-West fixed bandwidth) used						
for coefficient covariances						
Variable	Coefficient	Std. Error	t-Statistic	Prob.		
M2	-0.807814	0.330311	-2.445616	0.0147		
TBR	0.582522	0.111166	5.240101	0.0000		
MPR	-1.488463	0.217784	-6.834588	0.0000		
EXCH	-0.041062	0.016095	-2.551228	0.0110		
CRR	0.009351	0.114784	0.081470	0.9351		
LDR	0.039391	0.103975	0.378854	0.7049		
SDR	-1.222058	0.334153	-3.657183	0.0003		
R-squared	0.894931					
Adjusted R ²	0.873740					

Source: Author's Computation (2022)

Based on the panel dynamic least squares results presented in Table 5, it is revealed that M2 exerts a negative influence on stock price. A unit rise in M2 will bring about a 0.807814 fall in stock prices. The effect is statistically significant as shown by probability of t-Statistic of 0.0147 (<5% level of significance (LOS)). The results also show that Treasury Bill Rate (TBR) exerts positive effect on stock prices. A unit increase in TBR will bring about an increase of 0.582522 in stock prices. Again, this effect is statistically significant based on probability of t-Statistic of 0.0000 (less than 5% significance level). Furthermore, it is shown that MP rate (MPR) negatively affected stock prices such that a unit rise in MP rate will reduce stock price by 1.488463. This relationship is also statistically significant based on t-Statistic probability of 0.0000 (less than 5% LOS). Likewise, exchange rate (EXCH) impacted stock prices negatively. A unit increase in exchange rate will lead to reduction of 0.041062 in STP. This effect is statistically significant given its probability of 0.0110 (< 5% LOS). On its part, cash reserve ratio (CRR) has positive impact on stock prices such that a unit growth in CRR will bring 0.009351 rise in STP. However, the impact is not statistically significant as revealed by its probability (0.9351). For every increase in lending rates (LDR), STP will increase by 0.039391. This increase is, however, not significant statistically as depicted by its probability of 0.7049.

Finally, savings and deposit rates (SDR) exert inverse effect on STP such that an increase in SDR will lead to reduction of about 1.222058 in STP. It is noteworthy that the effect is statistically significant given its probability value (0.0003). Based on these outcomes, effects of MP variables examined on STP of banking firms can be grouped into three. The first group comprises of M2, MPR, EXCH and SDR wherein the variables have negative and significant effect on stock prices. The second group is made up of TBR only which has a positive and significant effect on stock prices and the third group comprises of CRR and LDR which have positive but insignificant effect of stock prices. The coefficient of determination (Adjusted R²) 0.873740 implies that not less than 87% of variations in STP of banking firms is explained by MP variables. This means that the selected MP variables are, largely, veritable tools through which stock prices are explained among banking firms in Nigeria between 2006 and 2019.

Analysis of Causality

The fourth objective of this study is to ascertain whether any causal relationship exists between MP and stock prices of banking firms in

Nigeria. The tests of causality among these variables are done based on data of each bank considered. The decision rule on whether two variables have causal link is to compare the probability of F-Statistic with the LOS (5% here). If the Prob (F-Stat) is greater than 5% LOS for two variables considered, our null hypothesis stating no causal relation cannot be rejected and vice-versa. A uni-directional causality arises when the probability of only one variable considered is less than 5% LOS. Furthermore, where the probabilities of F-Stat of two variables considered is short of 5%, it implies that the variables have bi-directional causality. Table 6 contains the summary of the panel causality test for banking firms' data.

Table 6

Null Hypothesis	F-Statistics	Prob.	Answer	Comment/Conclusion
"M2 causes STP"	0.88346	0.4139	No	"No causality "
"STP causes M2"	1.15280	0.3165	No	
"TBR causes STP"	0.74376	0.4758	No	"Uni-directional causality
"STP causes TBR"	6.64620	0.0014	Yes	from" STP to TBR
"MPR causes STP"	16.0467	2.E-07	Yes	"Uni-directional causality
"STP causes MPR"	1.91681	0.1480	No	from" MPR to STP
"EXCH causes STP"	1.25933	0.2846	No	"Uni-directional causality
"STP causes EXCH"	4.63291	0.0101	Yes	from" STP to EXCH
"CRR causes STP"	5.94562	0.0028	Yes	"Uni-directional causality
"STP causes CRR"	1.45694	0.2338	No	from" CRR to STP
"LDR causes STP"	8.78977	0.0002	Yes	"Bi-directional causality
"STP causes LDR"	16.0985	2.E-07	Yes	between" LDR and STP
"SDR causes STP"	39.5060	8.E-17	Yes	"Bi-directional causality
"STP causes SDR"	8.35366	0.0003	Yes	between" SDR and STP

Panel Causality Test Results – Banks

Source: Authors' Computation (2022)

Table 6 reveals that six (6) out of seven MP variables examined have causal association with stock prices of banking firms selected with probabilities of F-Statistics less than 5% LOS. As shown by their respective probabilities (<5% significance level), changes in TBR is caused by changes in STP; MPR Granger causes STP; EXCH and STP Granger cause each other; CRR Granger causes STP; LDR and STP Granger cause each other and SDR and STP Granger cause each other. However, there exists no causal connection of M2 and STP

(probabilities > 5% significance level). The implication of these results is that changes in selected banks stock prices are caused by changes in some MP variables examined (namely, MPR, CRR, LDR and SDR more than previous changes in stock price itself. Furthermore, stock prices cause greater changes in TBR, EXCH, LDR and SDR more than the previous changes in these MP variables themselves. These findings agree with Nwakoby and Alajekwu (2016) and Adeyeye and Migiro (2017). Changes in M2 does not cause an important change in stock prices, neither does the latter cause any significant change in former.

DISCUSSIONS OF FINDINGS

The first objective of this study is to examine effects of MP variables on stock prices of banking firms in Nigeria. The hypothesis tested is that MP does not have significant effect on stock prices of selected banking listed on NSE in Nigeria. This section highlights the interpretation and implication of findings on relationship between MP and stock market prices of the selected banks in Nigeria.

Theoretically, increase in broad money supply is expected to trigger increase in investment in stocks. However, as revealed in this study, despite increases in money supply over years, stock prices have continued to fall. As can be seen from the analysis, this MP tool has negative and significant effect on stock prices of banking firms studied. This agrees with findings of Bala and Hassan (2018); Ayopo, Isola, Somoye and Nwanji (2018) and Okechukwu et al. (2019) while contradicting the position of Yola (2019). This could be attributable to increases in money in circulation not being used for trading in stocks and aftermath effect of global economic meltdown/stock market crash since 2008. Money supply will spur stock price increase only if investors anticipate favourable future returns on their investment. Years on, uncertainties that marked the stock market have scared potential investors from the market.

Secondly, the positive effect of Treasury bill rate on stock prices could be attributable to the vantage position of banks in implementing OMO. Suffice that Treasury bill issues are means of mobilizing shortterm funds from the public through banks. Increased rate of Treasury bills issues (bought) from the public constitutes a means of making more funds available for investment to investors. These funds can be invested stocks which can cause its price to increase.

Thirdly, a negative and considerable effect of MP rate on stock prices of banks is expected. Monetary policy rate (MPR), being price at which banks borrow from Central Banks, is theoretically viewed as a tool to regulate volume of fund available for investment and operation purposes. The higher the MPR, the lower the capability of banks to access funds which could be loaned to investors who might be willing to trade in stocks. Notwithstanding, an inverse and significant of MPR on stock prices calls for concern. Since one major goal of MP is to promote sound financial system (including stock market), financial regulatory authorities should make deliberate efforts to minimize the adverse effect of MPR on stock market indicators as much as possible. Furthermore, exchange rate exerts significant impairing effect on stock prices. Again, theoretically, this is expected. Though there could be situations where weak local currency would attract foreign investment into stock market, usually, higher exchange rate elicits lesser individuals and corporate organizations who depend largely on foreign exchange invest in stock market. As noted by Qing and Kusairi (2019), exchange rate increase can affect stock prices of exporting firms that could earn more in local currency through exports. This result contradicts findings of Ayopo, Isola, Somoye and Nwanji (2018); Bala and Hassan (2018) and Oniore and Akatugba (2017). Cash reserve ratio (CRR) exerts positive effect on stock prices of banks. This is contrary to theoretical expectation regarding the relationship between cash reserve ratio and stock prices as it is expected that a high CRR will reduce banks' ability to lend for investment in the stock market. However, it is important to note that the positive effect is insignificant.

Lending rate exerts positive but statistically insignificant effect on stock prices of banks examined. This, though not significant, is expected for banks since interest on loans constitutes the major source of revenue for them. The higher the interest banks charge on loans and advances, the higher the possibility that more earnings will accrue to the banks. The insignificance of this effect may be attributable to the fact that banks are yet to fully exploit increases in interest rates to significantly improve their market price of stocks or that borrowers avoid high interest loans for investment in bank shares in Nigeria for the years. Finally, savings deposit rates exert negative and statistically strong effect on stock prices of banks. This is also expected because higher interest on deposit reduces banks liquidity and their ability to lend. This may translate to lower revenue, profit and dividends which may trigger less enthusiasm in trading in their stocks. The foregoing analyses have shown that MP exerts significant effects on stock prices of Nigerian banks contrary to the first null hypothesis that dismisses significant relationship between them. This hypothesis cannot be accepted based on findings in this study. This submission has sufficiently addressed the first objective of the study.

CONCLUSION AND RECOMMENDATION

This research was conducted to examine empirically the relationship between monetary policy (MP) and stock prices of listed deposit money banks in Nigeria. The study was done to answer two main research questions based on set objectives. One, it provided answer to research question whether and how selected MP variables (M2, TBR, MPR, EXCH, CRR, LDR and SDR) affect stock prices of selected listed banking firms. Two, it answered the question on whether causal relationship exists among MP and stock prices of the banks. The study found that monetary policy variables significantly affect stock prices of banking firms quoted on the NSE between 2006 and 2019. MP variables, namely M2, MP rate, exchange rate and savings deposit rate positively and significantly affect stock prices of the listed banks. Finally, we conclude that there is causal connection between MP and stock prices of banking firms in Nigeria with six (6) of seven (7) MP variables examined having causal link with stock prices of banks.

Reflecting on this issue, the researchers recognize the onerous task involved in MP formulation and execution, particularly policy somersaults and conflicts, it is nonetheless necessary to recommend that the CBN holistically do regular appraisal of her MP efforts in relation to development and growth of stock market. As practitioners, we recommend that Nigerian banks should be more pro-active in managing effects of monetary policy announcements to avert prolonged negative effects of such policies on their stock prices. The negative effect of most MP variables on stock prices of banks calls for pro-actions by banks that will make them benefit from monetary policy announcements instead of losing from it as the findings reveal in this research. We also advocate a re-appraisal of MP tools vis-àvis stock market expansion goal: A major goal of MP is maintaining stability and soundness in the country's financial system, including a strong stock market.

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