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## Effect of Financial Prices on CBN Policy Decisions 2000-2018

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### Abstract

This study investigated the effect of financial prices on CBN policy decisions between 2000 to 2018 by measuring the relationship between bond price level in Nigeria and CBN monetary decision policies (Monetary Policy Rate, Cash Reserve Ratio & Liquidity Ratio). In order to achieve this set objective, the study applied the methodology of Simple Linear Regression. The summary statistics shows that the probability value of the Jarque-Bera test statistics is greater than the critical value, implying that the data for the study is normally distributed. The results of the empirical estimates revealed that bond price has a positive effect on monetary policy rate and the effect is statistically significant ( $p < 0.05$ ). This means that a unit increase in Bond Price will lead to increase in MPR by a margin of 68%. The result of the Simple Linear regression analysis shows that bond price has a positive effect on Cash Reserve Ratio (CRR) and the effect is not statistically significant ( $p > 0.05$ ). This means that a unit increase in Bond Price will lead to increase in MPR by a margin of 34.00%. The result of the Simple Linear regression analysis shows that bond price has a positive effect on monetary policy rate and the effect is statistically significant ( $p < 0.05$ ). On this basis, it is recommended that policy reforms, which would help reduce the influence of the informal financial sector, be implemented. This would enhance the influence of the central monetary authority in the financial sector, and by implication, reduce the fluctuation of bond price which is affected by the several stochastic factors operating in the economy.

**Keywords:** Bond, Financial, Prices, Policy, CBN, Nigeria.

### Introduction

Large swings in financial prices figure prominently accounts for the much of the financial instabilities round the world. Indeed, a boom and bust in financial prices is perhaps the most common thread running through narratives of financial crises. This is true for both industrial and emerging market countries alike. Typical examples in recent decades include Latin America in the late 1970s-early 1980s, the Nordic countries in the late 1980s, and East Asia in the mid to late 1990s. These experiences are of course not new. In many respects the descriptions of the Australian boom and bust of the 1880-1890s, for example, could be used with only limited editing to describe some of the more recent episodes of financial instability.

Likewise, while perhaps more controversial, the experience of the United States in the late 1920s-early 1930s also exhibits similar features. Despite the importance of financial price developments, they have received relatively little attention in the recent empirical literature examining its role in monetary decisions by monetary regulatory authorities such as the Central Bank of Nigeria. To a large extent this reflects the lack of adequate cross-country data already mentioned (Wang and Wen, 2010).

Achieving monetary and financial stability requires that appropriate anchors be put in place in both spheres. In a fiat standard, the only constraint in the monetary sphere on the expansion of credit and external finance is the policy rule of the monetary authorities. The process cannot be anchored unless the rule responds, directly or indirectly, to the buildup of financial imbalances. In principle, safeguards in the financial sphere, in the form of prudential regulation and supervision, might be sufficient to prevent financial distress. In practice, however, they may be less than fully satisfactory. If the imbalances are large enough, the end-result could be a severe recession coupled with price deflation. While such imbalances can be difficult to identify *ex ante*, the results presented in this paper provide some evidence that useful measures can be developed to guide the effect of financial prices on the Central Bank of Nigeria monetary decisions. This suggests that, despite the difficulties involved, a monetary policy response to imbalances as they build up may be both possible and appropriate in some circumstances. More generally, co-operation between monetary and prudential authorities is essential (Ongena, Vasso and Peydró, 2009).

Monetary policy management is a routine thing, while the desire to attain a specific macroeconomic objective often conflicts with the attainment of other competing objectives. More so, financial integration and unrestricted trade flows exert influences on domestic financial policies and prices. It is, therefore difficult, especially given the above theoretical underpinning, to disentangle the conduct of monetary policy from events at the global and domestic stage/economy and the Nigerian Stock exchange market (NSE) in particular. More profoundly, is when such permutations coincide with a particular episode – the global financial crisis, 2008 - 2011. The impact of the crisis on the financial sector of the economy in general and the NSE was limited, largely owing to the low level of financial integration with the global economy. Earlier, activities in the market peaked during the banking sector consolidation/ recapitalization which started in 2005 and up until 2008. Thus, the market experienced sustained increase in stock prices with investors reaping tremendous profits (Brogaard, Hendershott and Riordan, 2014).

The advent of the crisis rattled the market and caused the market indices to crash. Evidences, for instance, from the market showed that market capitalization (MC), which stood at 10.18 trillion Naira in the year 2007, dropped to 6.96 trillion in 2008 and further down to 4.99 in 2009. This heaved up in 2010 to 6.29 trillion. In similar vein, the All-Share index (ASI), which was 57,990.12 Naira in 2007, dropped to 31,450.78 and 20,827.17 in 2008 and 2009, respectively, and eventually picked up at 25,861.93 in the year 2010. Policy responses during the turmoil by the NSE and regulators like the Securities and Exchange Commission (SEC) were: review of trading rules and regulations and delisting of some 19 moribund companies. The corporate governance framework was also strengthened in both the NSE, and the regulator, SEC, market signals were sharpened and standards were raised (Olusegun, 2013).

Other empirical studies focusing on stock market response to monetary shocks, report that a 25-basis point increase in the Fed funds rate is associated with an immediate decrease in broad US stock indices that ranges from 0.6 to 2.2 percent, sample size and estimation method aside; Craine and Martin (2004), Rigobon and Sack (2004), Bernanke and Kuttner (2005) and Bjornland and Leitemo (2009). Earlier, Christiano *et al.* (1999) carried out an extensive survey of empirical studies on the effect of monetary policy shocks on macroeconomic variables. Juat-Hong (2009) reveals that only the anticipated component of money supply shock affects the volatility of equity returns in Malaysian market but the unanticipated components do not.

Monetary policy relates to the supply of money and credit allocation, which is controlled via factors such as interest rates and Cash Reserve Requirements (CRR) for banks by the CBN in order to influence outcomes like economic growth, inflation, exchange rates with other currencies and unemployment. Interest rates, reserve requirements; currency peg, discount window, quantitative easing, Open Market Operations; and signaling are some of the tools of monetary policy. Monetary policy involves changing the interest rate and influencing the money supply. It is a policy used to pursue policies of higher economic growth or controlling inflation. It is usually carried out by the CB/monetary authorities who is charged with the following monetary policy role of maintaining price stability, exchange rate stability, balance of payment equilibrium, maintaining full employment and growth in the economy as highlighted earlier (Odior, 2013).

Bond prices influences the CBN policy decisions as they formulate monetary policy decision. A bond is an IOU. That is, a bond is a promise to pay, in the future, fixed amounts that are stated on the bond. The interest rate that a bond actually pays therefore depends on how these payments compare to the price that is paid for the bond. That price is determined in a market, so as to equate the implicit rate of interest paid on the bond to the rate of interest that buyers could get on other bonds of comparable risk and time to maturity. Figuring out what the interest rate on a bond is can be a quite tricky, since most bonds make payments for several years and of different sizes. Less tricky is to go the other direction, from the interest rate to the price of the bond (Central Bank of Nigeria, 2016c).

### **Statement of Problem**

The volatility of bond price is one of the predator of used by the monetary authorities in making policy decisions. As a result of this, the Monetary Policy Rate, Cash Reserve Ratio & Liquidity Ratio are affected by the movement of the bond prices in the market. The influence of bond price on the Central Bank of Nigeria Policy decisions proxied by Monetary Policy Rate, Cash Reserve Ratio & Liquidity Ratio could be as a result of the volatilities caused by varieties of factors mostly like market forces, government policies, political instabilities among others.

It is against this backdrop that this study examines the effect of effect of financial prices on CBN policy decisions for the period of 2006 - 2018. The specific objectives of the study is to; examine the effect of bond price on monetary policy rate, determine the effect of bond price on liquidity rate and determine the effect of bond price on cash reserve ratio (CBN 2014).

## Literature Review

### Theoretical Review

In recent times, the relationship between monetary policy and financial prices has attracted considerable attention among researchers and policymakers. Academics and policymakers alike have debated whether monetary policy should respond to developments in financial markets (see Bernanke and Gertler, 2000, and Rigobon and Sack, 2001), and when it does, the extent to which such swings might have been caused by monetary policy itself. To understand all these, a strong theoretical underpinning becomes very necessary. Chami, Cosimano and Fullerkamp (1999), for example, suggest the existence of a stock market channel of monetary policy besides the traditional interest rate and the credit channels. In their view, inflation induced by monetary expansion reduces the real value of the firms' financial assets which acts as a tax on capital stock. This could be viewed from two perspectives: first, the real value of the flow of dividends is reduced with higher inflation, and second, dividends are reduced because higher inflation reduces the supply of labor, and hence fall in production. The traditional interest rate channel was also equally investigated by Bernanke and Blinder (1992), Thorbecke (1997) and Rigobon and Sack (2003).

Alternatively, the discounted cash flow model argues that stock prices are equal to the present value of expected future net cash flows. A model by Campbell (1991) applied by Bernanke and Kuttner (2005), showed that a surprise increase in the MPR decreases stock prices in three ways: (i) decreasing the expected future dividends, (ii) increasing the future risk-free rate (iii) increasing the equity premium (above the risk free rate) required to hold equities. Monetary policy should, thus, 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. In this regard, restrictive monetary policy is associated with lower stock prices given the higher discount rate for the expected stream of cash flows and/or lower future economic activity, while expansionary policy is commonly viewed as good news because it is usually associated with low interest rates, increases in economic activity and higher earnings for the firms in the economy. A study by Fair (2002) showed that one-third of the changes in the equity prices are associated with news on monetary policy.

From the foregoing, the impact of monetary policy shocks on stock prices during crisis can be different in a number of direct and indirect ways – Pennings, Ramayandi and Tang (2011). A rise in the MPR, which leads to first round falls in stock prices, they argued could lead to a second round of selling induced by margin calls. Mishkin (2009) found that a cut in the MPR during crisis leads to a larger-than-normal rise in expected future dividends, and hence a larger-than normal rise in stock prices. Conversely, when MPR cuts are passed on to firms, then the effect of policy on future profitability is weaker, and so policy changes during the crisis have smaller effect on stock prices. However, policy announcements that involve keeping the rates lower for longer period during crisis, such as in the US during the global financial crisis, may reduce the expected risk free rate by more than is normally expected. Mishkin (2009) further argued that a change in MPR may also have a stronger effect on risk premia during crisis and this concurs with the earlier study by Bernanke and Kuttner (2005) for the US economy.



### Empirical Review

Farka (2008) further showed that policy shocks have a significant impact on the conditional volatility of stock returns with the latter displaying a tent-shaped pattern, that is, abnormally low several hours before announcement — calm-before-the-storm-effect, increasing significantly during the announcement period, declining steadily while still remaining elevated after the announcement, and continuing to decrease on the day following the policy release.

Jensen, Mercer and Johnson (1996) suggested that monetary environment affects investors' required returns. Fama and French (1989), Jensen *et al.* (1996), Booth and Booth (1997). Other empirical studies indicated an asymmetry between business conditions and stock returns; business conditions could predict future stock returns only in periods of expansive monetary policy.

Conover, Jensen and Johnson (1999) argued that not only the US stock returns, but also returns on foreign markets hinge with the US monetary environments (as well as their local monetary environment). They found that stock returns in twelve OECD countries over the period 1956- 1995 are generally higher in expansive US and local monetary environments than they are in restrictive environments.

Thorbecke (1997) using a VAR methodology found that monetary policy shocks have a greater impact on smaller capitalization stocks, which is in line with the hypothesis that monetary policy affects firms' access to credit. Furthermore, he showed that expansionary monetary policy exerts a large and statistically significant positive effect on monthly stock returns.

Similarly, Cassola and Morana (2004) applied the co integrated VAR system which includes real GDP, inflation, real M3 balances, short term interest rate, bond yield, and real stock prices to examine the transmission mechanism of monetary policy in the Euro area. Their results from impulse response analysis indicate that a permanent positive monetary shock has a temporary positive effect on real stock prices.

Chiang and Chiang (1996) examined the impact of predicted money growth volatility, predicted real output volatility, predicted exchange rate volatility and predicted US stock market volatility on the market volatility of Canada, Japan, United Kingdom and Germany markets. Their findings showed that only the US market volatility has a significant positive impact on the four countries' stock return volatility.

Kearney and Daly (1998) presented evidence that the conditional volatility of interest rate and inflation are directly related to the Australian stock market volatility whereas money supply, industrial production and current account deficit are indirectly related to the market's stock volatility. Money supply was found to be the most significant variable in the model.

Moreover, Beltratti and Morana (2006) explored the casual linkages from macroeconomic volatility to stock market volatility. They reported that a prolonged period of high stock market volatility during the phase of economic growth is associated with an increase in money growth volatility

### Research Methodology

Ex-post factor research designs was adopted for this study. It examines how the variables of the study interacted. The study covered the period of 2000 to 2018. The data was obtained from the Central Bank of Nigeria Statistical Bulletin.

The hypothesis formulated was tested by means of the estimates of regression analysis. Thus, from the random sample from the population, we estimate the population parameters and obtain the sample linear regression model:

$$(1) \quad \hat{y}_i = \beta_0 + \beta_1 x_i + e_i$$

The residual,  $e_i = y_i - \hat{y}_i$ , is the difference between the value of the dependent variable predicted by the model,  $\hat{y}_i$ , and the true value of the dependent variable,  $y_i$ .

$$(2) \quad \text{MPR} = f(\text{BDP})$$

$$(3) \quad \text{CRR} = f(\text{BDP})$$

$$(4) \quad \text{LQR} = f(\text{BDP})$$

The explicit relationship between the variables of the study is shown below.

$$(5) \quad \text{MPR} = b_0 + b_1 \text{BDP} + U_t$$

$$(6) \quad \text{CRR} = b_0 + b_1 \text{BDP} + U_t$$

$$(7) \quad \text{LQR} = b_0 + b_1 \text{BDP} + U_t$$

Where,

MPR = Monetary Policy Rate

CRR = Cash Reserve Ratio

LQR = Liquidity Ratio

BDP = Bond Price

$b_0$  = Intercept or constant term

$b_1$  = Parameter estimates of the model and

$\varepsilon$  = the error term

*A priori* expectation

$$b_1 = 0$$

Under the further assumption that the population error term is normally distributed, the estimated standard errors are used to create confidence intervals and conduct hypotheses tests about the population parameters. Simple Linear regression model is used if the data is integrated of order zero, the goodness of fit of the model is confirmed using R-squared. The statistical significance of the estimated parameters is checked by an F-test of the overall fit, followed by the probability value of the individual parameters. The decision rule for accepting or rejecting the hypotheses of the study is based on the probability value of the estimate. Thus, *If the probability value of  $b_i$  [ $p(b_i) > \text{critical value}$ ] we accept the null hypothesis, that is, we accept that the estimate  $b_i$  is not statistically significant at the 5% level of significance. If the probability value of  $b_i$  [ $p(b_i) < \text{critical value}$ ] we reject the null hypothesis, in other words, that is, we accept that the estimate  $b_1$  is statistically significant at the 5% level of significance.*

### Results and Discussion

The various descriptive statistics that are discussed are minimum, maximum. Mean and standard deviation for all variables of the study. These are contained in Table 1.

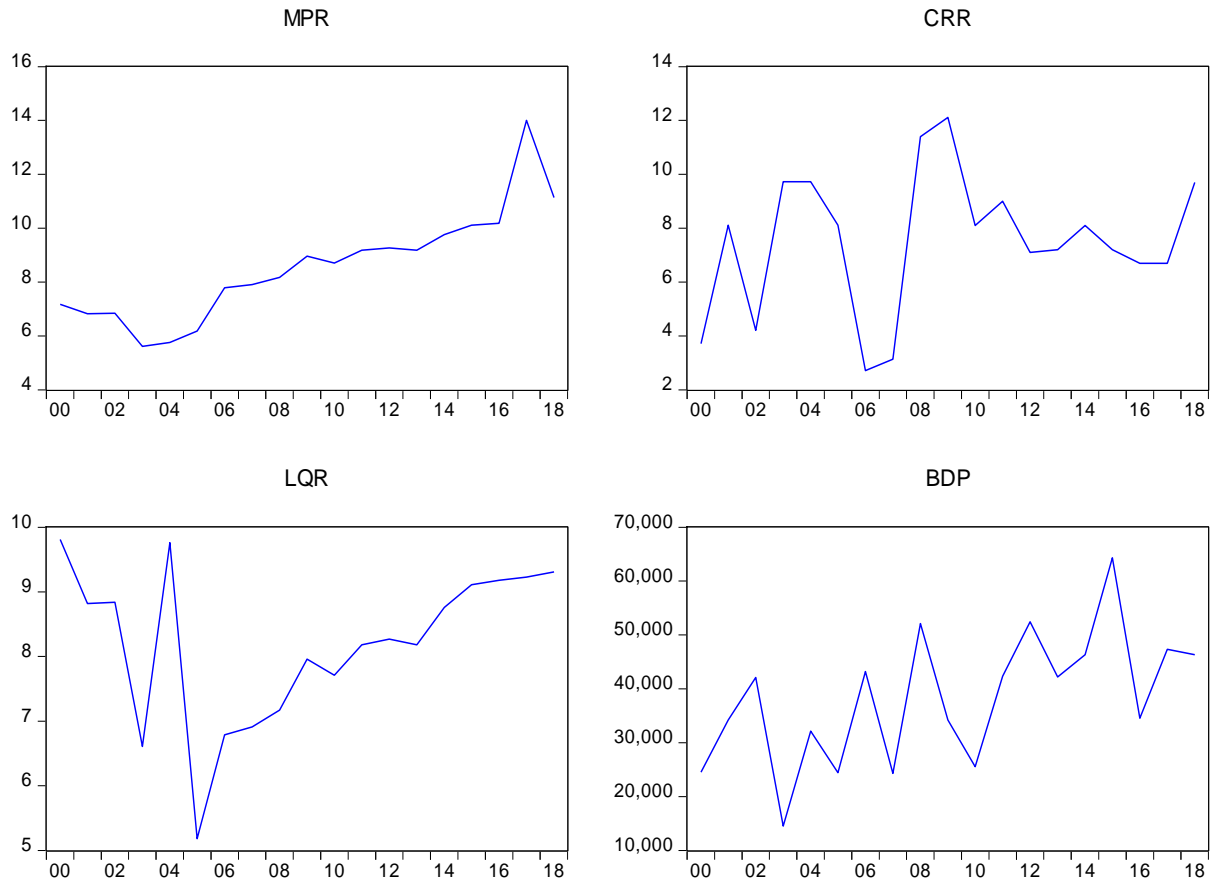
**Table 1: Descriptive Statistics**

	MPR	CRR	LQR	BDP
Mean	8.565263	7.513158	8.198947	38273.42
Median	8.710000	8.100000	8.270000	42112.00
Maximum	14.00000	12.11000	9.810000	64321.00
Minimum	5.610000	2.710000	5.180000	14533.00
Std. Dev.	2.047550	2.622637	1.222015	12337.56
Skewness	0.748946	-0.300772	-0.777297	0.043326
Kurtosis	3.751729	2.456528	3.015802	2.556897
Jarque-Bera	2.223616	0.520296	1.913468	0.161380
Probability	0.328964	0.770937	0.384145	0.922479
Sum	162.7400	142.7500	155.7800	727195.0
Sum Sq. Dev.	75.46427	123.8080	26.87978	2.74E+09
Observations	19	19	19	19

**Source:** Author's Computation using E-views 10.0

The descriptive results on Table 1 reveal that Monetary Policy Rate (MPR) averaged 8.565263 units over the period of study with a standard deviation of 2.047550. In the same vein Cash Reserve Ratio (CRR) has a mean value of 7.513158, a standard deviation of 2.622637 within the period under review. Liquidity Ratio (LQR) and Bond Price have respective mean values of 8.198947 and 38273.42 and standard deviations of 1.222015 and 12337.56 respectively. Also, the result of the Jarque-Bera test of normality showed that all the variables are normally distributed given that their respective probability values are greater than the critical value ( $p > 0.05$ ). This means that the variables are normally distributed and as such can be used in examining the relationship that exists in the model of the study.





The trend of the variables over-time is depicted by the graphs above which shows trend analysis of the variables as they move from one year to the other during the study period. The graph of the Monetary Policy Ratio (MPR) against year shows a trend with fluctuating pattern which is orchestrates the varying degrees of various rates adopted by the Central Bank of Nigeria Monetary Policy Committee. Cash Reserve Ratio (CRR) shows a highly cascaded graph of CRR against year. This shows the rate of fluctuations of the rate as occasion the changing monetary policy over-time. Liquidity ratio was at its highest in 2004 and at its lowest in 2005. It thus had a gradual rise to very considerable height in 2018. Bond price showed a highly cascaded graph of the variable against year. Government policies among other factors must have been responsible for the volatility in bond price within the period under review.

### Regression Analysis

The effect of the independent on the independent variables of the study is examined in this section using the techniques of the Simple Linear Regression analysis as presented in Table 2 below:

**Model I: Effect of Bond Prices on MPR**

Dependent Variable: MPR

Method: Least Squares

Date: 07/11/19 Time: 09:39

Sample: 2000 2018

Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDP	0.68E-05	0.27E-05	0.961507	0.0087
C	0.859706	0.311382	0.705789	0.0018
R-squared	0.740332	Mean dependent var		8.565263
Adjusted R-squared	0.601528	S.D. dependent var		2.047550
S.E. of regression	1.711233	Akaike info criterion		4.011606
Sum squared reside	49.78139	Schwarz criterion		4.111020
Log likelihood	-36.11025	Hannan-Quinn criter.		4.028431
F-statistic	8.770526	Durbin-Watson stat		1.053362
Prob(F-statistic)	0.008743			

The result of the Simple Linear regression analysis shows that bond price has a positive effect on monetary policy rate and the effect is statistically significant ( $p < 0.05$ ). This means that a unit increase in Bond Price will lead to increase in MPR by a margin of 68%. The Durbin Watson Statistic indicates that autocorrelation is not a problem in the model of the study. This finding is in line with that of dam and Tweneboah (2008) who examined the impact of macroeconomic variables on stock prices in Ghana using quarterly data from 1991 to 2007. The value of the R-squared (0.740) indicates that about 74.0% of the total variation in the dependent variable is explained by the independent variables. Also given that the probability value of the F-statistic (0.008743) is less than the critical value of 0.05, the study fail to accept the null hypothesis and concluded that bond price has a significant effect on stock market performance in Nigeria.

**Model II: Effect of Bond Prices on CRR**

Dependent Variable: CRR

Method: Least Squares

Date: 07/11/19 Time: 10:04

Sample: 2000 2018

Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDP	0.34E-05	5.15E-05	0.259523	0.7983
C	7.002066	2.064009	3.392459	0.0035
R-squared	0.563946	Mean dependent var		7.513158
Adjusted R-squared	0.504645	S.D. dependent var		2.622637
S.E. of regression	2.693341	Akaike info criterion		4.918742
Sum squared resid	123.3194	Schwarz criterion		5.018157
Log likelihood	- 44.72805	Hannan-Quinn criter.		4.935567
F-statistic	0.067352	Durbin-Watson stat		1.605108
Prob(F-statistic)	0.798348			

The result of the Simple Linear regression analysis shows that bond price has a positive effect on Cash Reserve Ratio (CRR) and the effect is not statistically significant ( $p > 0.05$ ). This means that a unit increase in Bond Price will lead to increase in MPR by a margin of 34.00%. The Durbin Watson Statistic indicates that autocorrelation is not a problem in the model of the study. This finding is in line with that of [Huang, Liu and Rao \(2013\)](#) who studied Binary Tree Pricing to Convertible Bonds with Credit Risk under Stochastic Interest Rates and found the convertible bond price significantly affects CRR. According to the study, the convertible bonds usually have multiple additional provisions that make their pricing problem more difficult than straight bonds and options.

The value of the R-squared (0.5640%) indicates that about 56.4% of the total variation in the dependent variable is explained by the independent variables. Also given that the probability value of the F-statistic (0.798348) is greater than the critical value of 0.05, the study fail to reject the null hypothesis and concluded that the independent variable of the model did not statistically predict the model.

**Model III: Effect of Bond Prices on LQR**

Dependent Variable: LQR

Method: Least Squares

Date: 07/11/19 Time: 10:04

Sample: 2000 2018

Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDP	0.48E-05	2.25E-05	1.548744	0.0199
C	6.865921	0.902086	7.611161	0.0000
R-squared	0.823648	Mean dependent var		8.198947
Adjusted R-squared	0.702098	S.D. dependent var		1.222015
S.E. of regression	1.177139	Akaike info criterion		3.263351
Sum squared resid	23.55614	Schwarz criterion		3.362765
Log likelihood	-29.00183	Hannan-Quinn criter.		3.280176
F-statistic	2.398607	Durbin-Watson stat		1.456244
Prob(F-statistic)	0.019858			

The result of the Simple Linear regression analysis shows that bond price has a positive effect on monetary policy rate and the effect is statistically significant ( $p < 0.05$ ). This means that a unit increase in Bond Price will lead to increase in Liquidity ratio by a margin of 48.00%.

The Durbin Watson Statistic indicates that autocorrelation is not a problem in the model of the study. The value of the R-squared (0.8236) indicates that about 82.36% of the total variation in the dependent variable is explained by the independent variables. Also given that the probability value of the F-statistic (0.019858) is less than the critical value of 0.05, the study thus reject the null hypothesis that the model is not sufficient in explaining the relationship that exist in the model of the study.

## Conclusion and Recommendations

### Conclusion

This study investigated the effect of financial prices (bond prices) on CBN policy decisions between 2000 to 2018 by measuring the relationship between bond price level in Nigeria and CBN monetary decision policies (Monetary Policy Rate, Cash Reserve Ratio & Liquidity Ratio). In order to achieve this set objective, the study applied the methodology of Simple Linear Regression. The results of the empirical estimates revealed that bond price has a positive effect on monetary policy rate and Liquidity ratio and the effect in both cases is statistically significant. Bond price has a positive effect on Cash Reserve Ratio but the effect is not statistically significant.

On the whole, the role of monetary policy in promoting price stability leaves a gap to be bridged. This may be due to the high influence of 'Outside bank money' and the high level of participation in the informal financial sector in Nigeria. This has significantly reduced the influence of monetary policy instruments. On this basis, the researcher recommends that policy reforms, which would help reduce the influence of the informal financial sector, be implemented. This would enhance the influence of the central monetary authority in the financial sector, and by implication, reduce the fluctuation of bond price which is affected by the several stochastic factors operating in the economy. This will enhance the role of monetary policy in macroeconomic management in Nigeria. We also recommend a further investigation directed at unveiling the reason behind the volatility of bond price in the market and its effect in price stability in Nigeria.

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