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Responsiveness of Money Market Rates to Monetary Policy Committee Meetings (MPC) Communications

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Abstract. The Monetary Policy Committee (MPC) provides two sets of information to the financial market; it contains information on the policy decision, typically in the form of a change in cost of borrowing {monetary Policy Rate (MPR)} and level of liquidity in the market {Cash Reserve Requirement (CRR)}. The change in the both MPR and CRR affects other rates in the market because it represents a change in the cost of funds to the banks as well as liquidity in the economy respectively. The other set of information is that the committee communicates the future direction of monetary policy. These communications are likely to affect the market expectations, and therefore affect the interest rates. This study uses daily data for the period 2010-2019 to estimate the separate effects of monetary policy communication on money market rates, the study employed EGACH technique. It is found that the cost-of-money effect on the on money market rate is significant. So also, the effect of MPC communication on is found to be significant. This suggests that central bank communications is potentially a viable tool of monetary policy design and implementation in Nigeria. The study therefore suggests that the CBN should be proactive in designing an optimal communication strategy.

Keywords: Interest rates, Monetary policy rate, Liquidity ratio, EGACH

1. Introduction

Among the mandate of central bank of Nigeria is provision of sound and stable financial system. In order to achieve this, the monetary authorities set targets for key monetary and financial indicators, policy strategies that could lead to stable and sound financial system were develop. Among the strategies, the Monetary Policy Committee (MPC) communicates its policy decisions to the general public in order to coordinates financial markets agents, so that the financial system could be sound and stable (Salisu, 2012), this is because information on both current and future policy stand may/not increase the increase the degree of agents expectations.

The primary objective of monetary policy is the achievement of price stability (Sanusi, 2011 a); however this may sound ambiguous because one may ask which price? Is it the price of Naira in relation to other currencies (i.e. exchange rate, which could be nominal or real effective), price of capital/reward for accumulating financial asset (i.e. interest rate, which could be deposit or lending rate), or the price of goods and services in the country {i.e. the general price level, which could be core or non-core inflation?}. Whichever price the CBN seeks to stabilize, there is no doubt monetary policy seeks to limit the growth of money supply to a level that is consistent with the desired level of output and prices (inflation, interest and exchange rates) or tampered with cost of borrowing or liquidity. Looking at the importance of money markets in the development of any economies this study concentrates to interest rates.

Interest rate is a price of borrowing and must be right and attractive to reward depositors and encourage long term savings as well as reward lenders. There exist conflicting and competing views regarding what constitute an appropriate interest rate depending on

whose perspective – savers or lenders/borrowers (Abubakar, 2012). Over the recent past, communication policy has become an important instrument of monetary policy globally. The recognition of the effects of information asymmetries and uncertainties on economic activities has led Central Banks to attach greater weight to communication policy as an instrument of monetary policy. On this light most of the countries are given interest on interest rates due to the contributions of both interest rate and the monetary policy instruments {Monetary Policy Rate (MPR) and Cash Reserve Requirement (CRR)} in influencing macroeconomic variables of a country such as inflation, output, exports and imports. Therefore, this work aimed to investigate the responsiveness of interest rates to MPC meetings.

The empirical question the study would answer is whether such communications and signals have separate and independent effects on the interest rates and, therefore, enhance effectiveness of monetary policy in Nigeria. The empirical answer to this question is undoubtedly useful to the monetary authorities, especially the MPC.

Therefore this study seeks to address if MPC communications is an effective alternative or complementary measure in achieving price stability in Nigeria. From the problem statement, the following research questions emerged.

2. Literature Review

This section is divided into two sub-sections the theoretical and the empirical reviews

2.1.1 Market Formation of Expectation

Market agents form their expectation psychologically, because economic agents use both past and current information in formulating their future expectation (Frydman and Goldberg, 2012). For instance, if market agents are interested in long-term returns, speculators are expecting rising rates and borrowers wishing to acquire long-term funds. These may lead to rise in demand for short-term fixed earning security (such as bond); and also, would require a rise in long-term yields in relation to short-term yields (Sergio and Frank, 2004). Therefore, these actions by investors, speculators, and borrowers would bid up the term structure upward until it is consistent with expectations of higher future interest rates. Thus, the long term interests depend on the expected series of short term (overnight) rates. This can be shown algebraically in equation (1).

$$R_t = \alpha_t + \frac{1}{n}(r_t + r^x{}_t + r^x{}_{t+1} + r^x{}_{t+2} + \cdots + r^x{}_{t+1+n}) + \varepsilon_t \text{----------} 1$$

Where:

R_t = Longer term rate of interest

α_n = Term premium

r_t = Current overnight rate

$r^e{}_{t+1}$= today's expectation of tomorrow's overnight rate and so on for.

ε_t = Error term implying that the term premium might be stochastic.

2.1.2 Market Expectations and Policy Communication

Investors in the stock market normally use information at hand to manage or coordinate future expectation in order to benefit most. Therefore, they consider Communication of central banks as one of the sources of information in which they respond to. If the Communication is in the right direction then it would be effective while non-effective if otherwise (Blinder, Ehrmann, Frasztscher, De Haan, and Jansen 2008). Furthermore, a well design Communication helps in strengthening the institutional independence of central banks, as well as enhancing the effectiveness of monetary policy (Egbuna, 2008).

According to Blinder et al. (2008) and Egbuna, (2008) Communication can be used as a strong instrument in the central banking, this is because it influences financial market and macroeconomic variables via expectation, and this is because Communication can manage future expectation on the economic activities and future monetary policy. While on the other hand, some scholars such as Ehrmann and Fratzscher (2005) and Blinder (2004) cited in Blinder et. al., (2008) have contradictory view, according to these scholars; central bank Communication may end up confusing market agents instead of enlightening them, also Communication may send bad signals to market agents, hence, information asymmetry and uncertainties influence policy makers to consider their Communication as an instrument and effective channel of monetary policy while not in reality.

But Blinder et al. (2008) assert that central bank may choose to communicate at a particular time because of a sudden change in the economic outlook or some other news due the fundamentals in the markets, central bank can uses its Communication to influences future expectation on short term rate, which influences long term rates and economic activity (financial market prices), and these prices affected macroeconomic variables and output. While

central bank meetings, just like monetary policy, affect financial markets very quickly, interest rates and asset prices affect the economy slowly. This is because many factors other than monetary policy influence macro variables, but financial market variables are reacting mostly to central bank communication.

A simple macroeconomic framework designed by Blinder et al. (2008) can be used to illustrate the role of central bank meetings.

$Y_t = D\ (r_t - \pi_t^e,\ R_t - \pi_t^e,) + \varepsilon_t$ ---------- 2

Given that the current overnight rate (r_t), the long term rates (R_t), and expected inflation (π_t^e), equation (2) is the aggregate demand, which is a function of r_t, R_t,.

The aggregate supply function is given in equation (3), which could but not necessarily be something like the New Keynesian Phillips curve and can be

$\pi_t = Be\ (\pi_{t+1}) + \gamma\ (Y_t - Y_t^*) + \varepsilon_t$ ----------3

Given that π_t mean inflation and Y_t and Y_t^* mean actual and potential real output respectively, the aggregate supply function is a function of Y_t and Y_t^*, Be and γ are constant. Equation (3) model could be closed by appending a central bank reaction function (Taylor rule).

$r_t = G\ (Y_t - Y_t^*,\ \pi_t, \pi_t^*) + \varepsilon_t$ ----------(4)

Where:

π_t^* denotes inflation target of the central bank.

Central bank Communication and learning are inextricably intertwined. The feedback effect of learning on the economy can lead to unstable or indeterminate outcomes which effective Communication by the Central Bank can help to avoid. This link could be captured by equation (4).

According to Blinder et al. (2008) central bank Communication matter if at least one of the following conditions holds: nonstationarity (either in the economy or the policy rule), the feedback effect of learning on the economy by market agents, expectations to be non-rational and finally asymmetric of information between the public and the central bank.

$r^e_{t+j} = H_j\ (Y_t, R_t, r_t, \ldots., s_t) + \varepsilon_t$ ----------(5)

Where:

r^e_{t+j} = Interest rate expectations

S_t = vector of Central Bank signals.

Equation (2) indicate that aggregate demand respond to the overnight interest rate (short-term rate), equation (5) indicate that expected future short-term rate of interest respond to central bank signals. Therefore, central bank Communication is important instruments in influencing economic activities.

2.2 Empirical Review

The initial work in Nigeria is by Sanusi (2011a and b) who established that central bank Communication is a strong tool of monetary policy in Nigeria. While (Sanusi, 2010a) estimated the effects of monetary policy signals and cost of funds on the interbank call rate and Open Buy-Back (OBB) rate, his result shows that the cost of money effect on the Open Buy Back rate is larger than it is on the Call rate; Sanusi (2011b) estimated the effects of monetary policy signals on the Nigeria Interbank Offer Rates (NIBOR), his finding revealed that the rates are significantly more volatile during weeks of the MPC meetings. These studies suggest that signaling effects are significant monetary policy tools in Nigeria

Chuku (2009) identified the effects of monetary policy innovations on output and prices in Nigeria, he employed Structural Vector Autoregressive (SVAR) model and find out that monetary policy innovation (M2) has effects on output and prices most with a very fast speed of adjustment and that of MRR and Real Effective Exchange Rate (REER) has effect on the proportional effects on outpumts and prices. While Yusuf (2010) conducted a research on the Nigeria inter-bank and monetary policy rates nexus, to find whether there is long-run relationship between the two or not, he used unit root test and co-integration test and find out that there is long-run relationship between MPR in the inter-bank money market as well as other Deposit Money Banks' (DMBs) interest rates. Okwo, Eze and Nwoha (2012) examined the effect of monetary policy outcomes on macroeconomic stability in Nigeria from 1985 to 2010. Their result suggests that monetary policy as a policy option may have been inactive in influencing price stability

Oloni and Adewara (2013) conducted a research on macroeconomic effects of Central Bank independence and transparency in Nigeria. Their findings revealed that CBN independence and transparency means more employment for the Nigerian economy using panel regression. It has negative effect on inflation and interest rate. The finding shows that increased independence lead to low interest rate is particularly very important for the growth of the economy. Also, the finding reveals that CBN independence and transparent has negative effect on inflation and interest rate.

Other studies that empirical studies have been done on response of interest rate to central bank communications, such David and Kehinde (2015), Maxwell Jimoh and Oluwatosin (2014), Anthony, Uzomba and Olatunji (2016), (2017) among others employed GARCH family technique, others such as Abuakar (2012), Aliyu, Saidu, Zubair and Dawood employed VAR and OLS respectively, find out that communications play vital role in influencing interest rates.

All the studies used MPR as the only monetary policy instrument and ignore CRR, but this study considered both, the only studies that used CRR are Mahmud 2019, but his work was on the sensitivity of MPC communications on stock prices; since CRR can play vital role in both capital market and money market there is need to undertake similar studies in the money market. Also other studies did not consider Treasury bill and fixed deposit rates as dependent of the MPC communication while this study does.

3. Analytical Technique

To achieve the major objective of this study, which is to examine the effect of MPC meetings communications on the money market rates, this study adopted Exponential Generalized Autoregression Conditional Heteroscedasticity model (EGARCH). The choice of this model is informed by our conceptualization of the effect of MPC meetings on the exchange rate as well as the nature of the data-high frequency.

If the result clearly and convincingly suggests that MPC meetings provides evidence of volatility reduction in the money markets rates, we can then conclude that MPC meetings can be used as a tool of managing money market volatility in Nigeria. Hence, volatility modeling using the EGARCH model would enable us achieve the objective of this study.

The justification for using the EGARCH over other methods is because the phenomenon associated with interest rate is volatility clustering, that is period in which the interest rate exhibits wide swings. In this case, the EGARCH model captures such volatility clustering which gives it relative advantage over other methods of correcting for heteroscedasticity.

EGARCH Model

This is used to assess the effects of MPC meetings on interest rates and investigate if MPC pronouncements reduce volatility in the interest rate in Nigeria. The EGARCH model is usually specified in two forms that are the mean equation and the variance equation specifications

Mean Equation

Exponential Generalized Autoregression Conditional Heteroscedasticity (EGARCH) model is specifically designed to model and forecast variance. The variance of a dependent variable is defined as a function of exogenous variables, which consists of the lagged dependent and independent variables and other pure exogenous variables. In presenting an ARCH model, there are two distinct equations or specifications, the first for the conditional mean and the second for the conditional variance. But the baseline model is given in equation 1

$R = \alpha_t + MP + e_t$ ……..1

R_t = is the current interest rate

MP_t = is the monetary policy instruments such as MPR and CRR (both public and Private sectors)

u_t = error term

The mean equation for 'u_t'is specified in equation (1). The mean equation, it is written as a function of exogenous variables with an error term (u_t). Equation (2) is the conditional error distribution which is estimated either using normal (Gaussian) or students-t or generalized error distribution

$\mu_i = \sum_{j=i}^{p} \rho_i \mu_i + \varepsilon_i$----------2

Variance Equation

In this case, corresponding to the orders of ARCH 'p', GARCH 'q' and Asymmetric 'r', the conditional variance model, namely EGARCH(p, q, r), has the following general equation:

$$\log \sigma^2 = \omega + \sum_{j=1}^{q} \beta_j \log \sigma_{t-j} + \sum_{i=1}^{p} \alpha_{t-i} \left| \frac{\varepsilon_{t-i}}{\sigma_{t-i}} \right| + \sum_{k}^{r} \gamma_{t-k} \frac{\varepsilon_{t-k}}{\sigma_{t-k}} + \sum D$$

……3

Where:

Logσ^2 = the conditional variance, it is always non negative irrespective of the possible negative parameter values.

$\sum_{j-1}^{q} \beta_j \log \sigma_{t-j}$ = ARCH effects

$\sum_{i=i}^{p} \alpha_i \left| \varepsilon_{t-i} / \sigma_{t-i} \right|$ = GARCH effects

$\sum_{k=1}^{r} \lambda \varepsilon_{t-k} / \sigma_{t-k}$ = Leverage effect

$\sum D$ = Communication dummy, take the value of one at MPC meeting dates and zero otherwise

The variance equation, expresses the conditional variance as a function of own lag (last period forecast variance), one period lag of squared residuals (last period squared residual), monetary policy instruments, Dummy variable to capture the meeting days and an error term. The presence of Dummy in the variance equation enables this study to determine effect of MPC meetings on the conditional variance i.e. volatility. The ARCH and the GARCH terms are also importance; this is because the ARCH term indicates the extent of volatility reaction to the variable under consideration. While the GARCH term demonstrates the time shocks take to die out, in other words it shows the spill-over effect.

The study used daily exchange rate data for the period 2010-2018. The data for this study depend mainly on secondary sources obtained from Central Bank of Nigeria (CBN) via its web site www.cenbank.org. The rationale for choosing the MPR and CRR is because they are used by MPC members to control the supply of money, availability of money, and cost of money or rate of interest. Also, the starting date was chosen because the inauguration meeting of MPC was in January, 2010. The inaugural meeting was held in an era of greater transparency in monetary policy decisions with the adoption of communication policy as an important instrument of monetary policy. The influence improved transparency on the expectation formation process of the financial market participant and is therefore, likely to influence financial variables.

4. Unit Root Test

Before the application of a standard econometric technique, it is required that variables should be stationary. As a result, we carry out the stationary test on the variables: CRR, CRRP, R, and MPR. Non-stationary series usually result to producing a spurious regression results. Making inferences from this kind of models may be misleading. The results of the ADF and PP tests are reported in Table 1

The results of the ADF and PP tests as shown in Table 1 indicate that all the variables are not stationary at levels, except MPR and R which proved. As a result of this, we differenced all the series once in the case of both the ADF and PP tests. The variables became stationary after being differenced once. We therefore, conclude that the variables (CRR, CRRP) are integrated of order one, I(1) at all level of significance.

Table 1: The Summary of Unit Root Test

Test	ADF TEST P. Values		PP TEST P. Values		
	Level	1ST Diff.	Level	1ST Diff.	Remark
Variable					
CRR	-1.303542 (0.6300)	-45.09511 (0.0001)	-1.303394 (0.6301)	-45.09511 (0.0001)	I(1)
CRRP	-1.092575 (0.7208)	-39.91961 (0.0000)	-1.093213 (0.7205)	-39.91961 (0.0000)	I(1)
EX	-0.051535 (0.9526)	-34.06065 (0.0000)	-0.051535 (0.9526)	-44.79572 (0.0001)	I(1)
MPR	-5.378503 (0.0000)		-5.695056 (0.0000)		I(0)
R	-2.924568 (0.0427)		-2.926748 (0.0425)		I(0)
TB	-0.448444 (0.8984)	-45.17651 (0.0001)	-0.448444 (0.8984)	-45.17651 (0.0001)	I(1)
TD	-2.433557 (0.1326)	-45.05721 (0.0001)	-2.435538 (0.1321)	45.05721 (0.0001)	I(1)

The critical values are presented in parentheses in the above order of the significance levels.
Source: *Authors Computation Using E-views 9.0*

5. Results and discussions

Impact of Monetary Committee on Interest Rate

Having determined the distribution and the order of integration of the variables of study, this section estimates and reports the EGARCH model of equation. Different specifications of EGARCH model were estimated but the EGARCH (2, 2) was found to be appropriate, this was chosen based on the established model selection criteria. After comparing the AIC, SIC and R^2 which is lower in value compared to GARCH (1, 1) model. The EGARC (2, 2) model and is presented in table 2.

Table 2: EGARCH (3, 3) Estimation for Interest Rate (R)

Mean equation										
C 16.99909 (0.0000)		D(CRR) -0.008700 (0.7803)		D(CCRP) 0.002085 (0.8670)			MPR -0.013527 (0.0000)			
Variance equation										
C	ARCH(1)	ARCH(2)	ARCH(3)	GARCH(1)	GARCH(2)	GARCH(2)	LE(1)	LE(2)	LE(3)	D01
-2.802830 (0.0032)	1.439111 (0.0000)	0.664297 (0.1475)	0.336544 (0.6341)	0.028361 (0.8542)	0.040309 (0.8206)	-0.013563 (0.9370)	0.467846 (0.0935)	-0.175361 (0.7246)	0.115959 (0.7696)	1.480338 (0.0000)

Source: *Authors Computation Using E-views 9.0*

The result of the mean equation suggest that all the variables are not statistically significant unless MPR which is statistically significant at one per cent, the result shows a negative but weak (-0.013527) relationship between the interest rate and the MPR meaning that if MPR increases by one percent, interest rate will be increased by -0.013527. This could be as a result of either the monetary authority tempered with the asymmetric corridor of MPR or as a result of future expectation; this finding is consistent with that of Aliyu (2011).

While the result from the variance equation shows that all the ARCH and GARCH effect are statistically insignificant unless ARCH(1) while only LE(1) and communication dummy (D01) are statistically significant at one percent, ten percent and one percent respectively.

The ARCH coefficient indicates the extent of volatility reaction to the variable under consideration. The decision rule is that a value above 0.5 indicates intense reaction of the shock to the variable under consideration, while a value below 0.5 indicates mild reaction of the shock to the variable under consideration, therefore in this case the ARCH (1) coefficient is 1.439111 meant that interest rate is highly volatile in regard to MPC meeting this result is in consonate with that of Aliyu (2011).

So also the GARCH coefficient demonstrates the time shocks take to die out. The decision rule is that a value above 0.5, illustrates longer time shocks takes to die out and a value below 0.5 indicates shorter time shocks take to die out, the is not different from zero as obtained. So also, the leverage effect term (LE(1)) is different from zero as obtained the model means that the information or signals send my MPC at the end of each meeting is not symmetric in nature. This also indicates the existence of leverage effect. And finally the MPC communication has significant impact on interest rate; this finding is in line with all the others findings reviewed.

This involves determining if communication can be used a tool of managing interest rate volatility. Since it is found in our study, that communication reduces volatility in the Nigerian money market, it then follows that CBN can use communication as a tool of managing interest rate volatility in the Nigerian money market.

Impact of Monetary Committee on Treasury Bill Rate

So also after determined the distribution and the order of integration of the variables of study, this section estimates and reports the EGARCH model of three month Treasury bill rate (TB).

Table 3: EGARCH (1, 1) Estimation for Treasury Bill Rate (TB)

Mean equation				
C -0.000307 (0.9397)	D(CRR) -2.85E-05 (0.9999)	D(CRRP) -2.15E-06 (1.0000)	MPR 5.22E-05 (0.8948)	
Variance equation				
C -6.567625 (0.0000)	ARCH(1) 0.010000 (0.0000)	GARCH(1) 0.010000 (0.5072)	LE(1) 0.010000 (0.0000)	D01 0.000000 (1.0000)

Source: *Authors Computation Using E-views 9.0*

The result of the mean equation showed that Treasury Bill (TB) was positively but insignificantly related to MPR, while the TB showed a negatively but insignificantly related to CRR and CRRP; meaning that both the cost of borrowing and measure of liquidity do not influences TB.

While the variance equation revealed that ARCH (1) and LE (1) are positive and statistically significant while GARCH is statistically insignificant meaning that there is volatility of but it does not have spillover effect and there is symmetric effect, lastly the communication dummy suggest that the MPC meetings does not effect on TB
Impact of Monetary Committee on Time Deposit Rate

So also after determined the distribution and the order of integration of the variables of study, this section estimates and reports the EGARCH model of Time Deposit (TD).

Table 4: EGARCH (1, 1) Estimation for Time Deposit Rate (TD)

Mean equation				
C 8.82E-07 (0.0327)	D(CRR) -5.54E-08 (0.7026)	D(CCRP) -2.51E-08 (0.2845)	MPR -7.07E-08 (0.0000)	
Variance equation				
C -3.348755 (0.0000)	ARCH(1) -1.066258 (0.0000)	GARCH(1) 0.028544 (0.5072)	LE(1) 0.146061 (0.0000)	D01 -22.95813 (0.0000)

Source: *Authors Computation Using E-views 9.0*

Different specifications of EGARCH model were estimated but the EGARCH (1, 1) was found to be appropriate, this was chosen based on the established model selection criteria..
The mean equation revealed that all the variables are statistically insignificant unless MPR, and there is negative effect of MPR to TD.

On the other the variance equation shows that all the variables are statistically significant apart of GARCH (1). ARCH (1) as while as communication dummy revealed that there is reduction in the volatility, meaning that the CBN communication can be used to reduce the volatility in the TB market.

6. Conclusion and Recommendations

The results of the EGARCH models estimated in this work indicate that communication by MPC has significant effect on R, TB and TD in Nigeria during the period under review. These indices are indicators of the magnitude and movement of interest rates in Nigeria. Having found that MPC's communications *"Create News"* and *"Reduce Noise"*, In other words, communication by MPC *"Create News"* which manage market agents expectations and move monetary variables in the expected direction, and "*Reduces Noise*" which has to do with increasing the predictability of MPC actions, which in turn reduces uncertainty/volatility in the stock market. In other words The MPC communiqués, as noted earlier, reveal to the market the beliefs of the MPC about the future path of a number of economic and financial indicators. This information is used in setting the prices of many longer term financial assets. Therefore this provides empirical evidence in support of the literature that MPC communications have independent and separate effects on monetary policy outcome.

Having found that communication has significant effect on R, CR, TD and TB and reduces volatility in the Nigerian money market, we proffer the following recommendations:

- The study recommends that the MPC should be proactive in its communications to the public, and should seek to have an optimal communication strategy. It can be used in coordinating agents' expectation and for reduction of uncertainties/volatility in the Nigerian money market.
- The government through the monetary authorities can smoothen out any temporary fluctuations in the R, CR, TD and TB in Nigeria by using communication instead of using actual intervention. This would reduce cost of actual interventions which raises volatility and markets uncertainty. It also implies in turn that market volatility and uncertainty will be reduced as confirm by our findings or the results.

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