THE INTEREST RATE CHANNEL OF MONETARY POLICY TRANSMISSION MECHANISM IN NIGERIA: A REGIME-BASED ANALYSIS

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ABSTRACT
This study re-examines the interest rate channel of monetary policy transmission in Nigeria, against the backdrop of the changing macroeconomic conditions in the economy, which has seen inflation rise above the CBN single-digit threshold over the last five years, as well as GDP that has slipped into the negative territory for seven times since 2016Q1 till date. The study adopted the non-ARDL technique, an asymmetric method of ascertaining the passthrough of interest rate in two different regimes of positive and negative output growth. Findings from the estimates of both a linear and non-linear autoregressive model suggests that in the regime of positive output growth, the interest rate passthrough for Nigeria is negative and statistically insignificant, also, in the regime of negative output growth, the interest rate passthrough for Nigeria is equally negative and insignificant. However, the passthrough of interest rate during the regime of positive output growth appears to be higher and faster, compared with the regime of negative output growth, as during the regime of positive output growth which is synonymous to boom cycle in the business environment, banks are poised to lend to the private sector, due to increased productivity and investment in this regime. The study recommends that policy initiatives be directed at reducing the cost of operation of banks in Nigeria, as well as, bridging the gap between the policy rate and the real rate of lending, which would enhance and boost investment and output growth in the economy.

Keywords: Interest Rate Passthrough, Monetary Policy Rate, Lending Rate
JEL Classification: E43, E51, E52

1 INTRODUCTION

The formulation and implementation of monetary policy is the primary responsibility of central banks around the world, which is achieved by employing a number of policy instruments. The use of such instruments by the central bank to influence the availability and cost of credit, as a means of promoting economic goals is known as monetary policy. Specifically, its main objective is to achieve price stability. Other equally important objectives include the promotion of economic growth, exchange rate stability and balance of payment equilibrium. The effectiveness of monetary policy critically depends on a proper understanding of the transmission mechanism through which changes in a central bank's policy action affects the economy, particularly, prices and output. However, the policy tools under the control of the central bank are not directly linked to the policy objectives. Consequently, the central bank targets the changes in intermediate variables such as money supply, interest rates and bank credit with the aim of achieving the overall policy objectives.

The interest rate channel of monetary policy transmission mechanism (MPTM) is premised on the assumption of effective interest rate passthrough. Where this is the case, adjustments in

policy rates are reflected in bank lending rates. According to Gregor, Melecký, and Melecký (2021), under the condition of perfect competition, interest rate passthrough is unity, implying that a change in the policy rate would result in a direct and proportionate change in lending rates. However, studies like Wang and Lee (2009) and Haughton and Iglesias (2012) have shown the sensitivity of interest rate passthrough to macroeconomic factors like the state of the economy, business cycle and inflation. Other studies like Mojon (2000); Gregor and Melecký (2018); and Melecký and Melecký (2021), have argued that the passthrough of interest rate is influenced by macro-financial conditions, such as bank competition, credit risk premium, Central Banks' foreign exchange interventions.

In Nigeria, the main channels of monetary policy transmission are the interest rate, the exchange rate, and to some extent, the credit channels. However, the interest rate channel has been argued to being the dominant channel of transmission of monetary policy ((Uchendu (1996), Ajayi (2007), Mbutor (2009), and Ogbonna and Uma (2014)). As Nigeria continues to grapple with the rise in general price levels, concerns are being raised about the effectiveness of the current monetary policy framework of the Central Bank of Nigeria (CBN). The general argument is that the Monetary Policy Rate (MPR) has not been effective in signaling short-term money market rates. Also, the economy has been in doldrums, in which it witnessed three (3) episodes of recession, over the last decade. In recent times, GDP growth rate has been in the negative territory all through the four quarters of 2016, the first quarter of 2017 and in two (2) successive quarters during the Covid-19 Pandemic. The transmission mechanism of monetary policy was tested during these periods, especially in the wake of the Pandemic which led to the CBN resorting to other unconventional policies. When monetary policy has significant effects on the real economy, it can display further the asymmetric effects of monetary policy (Hess, 2004). After reviewing the effects of developments on monetary economics, the asymmetric effects of the extension of monetary policy is non-neutrality (Agénor, 2001). Consequently, this study seeks to re-evaluate the interest rate passthrough in Nigeria, and to test a regime-based analysis of the passthrough of interest rate on output growth, during the periods of positive and negative output growth, that is, the sensitivity of the passthrough of interest rate to changes in macroeconomic conditions, specifically output growth. This is the value-addition of this paper, which to the best of my knowledge, no study has carried out research on MPTM by examining these impacts. Therefore, it is important, to gauge the effectiveness of the prevailing monetary policy architecture in the country, and to evaluate the responsiveness of the entire framework in the ever-changing macro environment in Nigeria. The goal is to guide policy decisions that would improve the effectiveness of monetary policy in Nigeria, through the resulting policy recommendations of the study.

2 LITERATURE REVIEW

2.1 Theoretical Literature

2.1.0 Keynesian School of Thought

In the Keynesian theoretical system, the interest rate can affect the amount of money in the economy. The magnitude of this effect depends on liquidity preferences, marginal efficiency of capital, propensity to consume, wages and price variability (King, 1994). Overall, when monetary policy is valid under normal conditions, it can influence investments and demand through changes in interest rates, which can have a significant impact on output and employment (Greenwald & Stiglitz, 1993). In severe economic crisis, due to the existence of

"liquidity trap", the expansionary monetary policy is used to stimulate output and employment when growth is extremely limited. Thus, the Keynesian theory is invalid.

2.1.1 Neoclassical School of Thought

The Neoclassical school of thought is developed from the idea of money demand and supply enhancing the Keynesian school of thought. The function of money demand is consistent with income and interest rate (Arestis & Skouras, 1985). In the Neoclassical school, income is stable in the short-term. Therefore, the short-term interest rate is the main factor of money demand (Palley, 2003). Meanwhile, there is no stable linkage between money supply and nominal income. Under this condition, the effects of money supply on the economy are uncertain (Clarida, Gali & Gerter, 1999). Additionally, monetary policy is endogenous which could lead to central bank only controlling a part of the money stock in the economy, but also fulfils the effects of interest rate changes (Kakes, 2000).

2.1.2 Monetarist School of Thought

Monetarist School of thought is based on the economic theory that propounds that money supply is the most important driver of economic growth. As the money supply increases, demand for money equally rises. The monetarist school emphasises that money supply plays the most dominant role in economic activities and price level. In the determination of monetary policy objectives, the monetarist school believes that the quantity theory of money has a very important impact on the national economic output, consumption, investment, interest rates, exchange rates, and employment. The monetarist school believes that money supply is the optimal intermediate target of the central bank or monetary authority. The fundamentals of the monetarist school is the Quantity Theory of Money (QTM). The theory states that the money supply is multiplied by the rate at which money is spent per year equals the nominal expenditures in the economy. The formula is given as:

$MV = PQ$

Where M = Money Supply

V = Velocity (rate at which money changes hands)

P = Average price of a good or service

Q = Quantity of goods or services sold.

Here velocity is viewed as a constant, implying that money supply is a major determinant of GDP growth or economic growth. Consequently, economic growth is a function of economic activity (Q) and inflation (P). If V is constant and predictable, then an increase (or decrease) in M will lead to an increase (or decrease) in either P or Q. An increase in price levels denotes that the quantity of goods and services produced will remain constant, while an increase in the quantity of goods produced means than the average price level will be relatively constant. According to monetarism, changes in money supply will affect price levels over the long-term and economic output in the short-term. A change in money supply, therefore, will directly determine prices, production and employment. Friedman (1959) argues that the elasticity of interest rate for money demand is very low. This means that, due to the existence of sticky prices in the economy, changes in money supply in the short term can have a significant impact on actual economic activity. Moreover, in the modern financial system, money supply is the main content of the central bank's management and control of currency, and its role in economic development is extremely important.

2.1.1 The Monetary Policy Transmission Mechanism

The relationship between the monetary policy rate and the lending rate is the foundation for the interest rate channel of monetary policy transmission mechanism in Nigeria. The MPTM describes the process through which monetary policy decisions are transmitted to the real sector of the economy (output). It describes how policy-induced changes in the nominal stock of money or the short-term nominal interest rate impacts on real variables such as aggregate output and employment (Ireland, 2005). This further buttress the dynamic relationship between the MPTM and the real sector of the Nigerian economy. According to Hilton (1990) the interest rate channel represents the principal channel through which monetary policy can exert some control over commodity prices. The interest rate channel is predicated on the adjustments of the monetary policy interest rate by monetary authorities. For example, an expansionary monetary policy, which is reflected in a downwards adjustment of the policy rate, results in a fall in the long-term real lending rate interest rate. This will cause the demand for loanable funds to rise, thereby leading to a rise in investment spending, and subsequently, a rise in inflation and invariably, output.

In general, as central banks target monetary aggregates by adjusting interest rates, short-term money market rates are affected, and this leads to changes in long-term real interest rates, particularly the lending rates, in the case of Nigeria, maximum lending rate (MPR). This change in cost of loanable funds leads to adjustments in the process of financial intermediation, as the level of investment expenditure is affected. The final impact of the process is the reaction of inflation and output growth, resulting from the changes in the level of economic activities.

2.2 Empirical Literature

Monetary policy can be transmitted in two main phases; first is the policy-to-market; and the market-to-retail passthrough (de Bondt, 2005). Investigations of the patterns of interest rate passthrough has been debated and analysed over the years to give a justification of the direction of this passthrough to the real sector of the economy. Accordingly, whether in the short- or long-run, monetary policy may have different effects on the cost of borrowing vis-à-vis money's own rate, so that passthrough would differ in retail market between deposit and lending rates.

Kabir (2022) assesses the monetary policy impact on private sector performance in Nigeria by employing the ARDL technique which showed the existence of a long-run relationship among the variables and found a significant negative impact on private sector performance both in the short- and long-run between real interest rate and real exchange rate. In the same vein, by employing an ARDL technique, (Iheonu and Nwakeze, 2016) investigated the impact of output and real interest rate on Investment in Nigeria and found the existence of a long-run relationship among the variables. Consequently, there was a positive and significant impact on investment, while a one-period lag of interest rate has a negative but no significant impact on investment.

Obute et al., (2020) estimates inflationary threshold in Nigeria by using all components of the aggregate demand. The study employed the error correction model (ECM) and found that the variables were capable of adjusting back to equilibrium in an event of any temporary shock within a year. Also, the threshold for Nigeria is 8.0 per cent and recommended that the Central Bank of Nigeria should gear its inflation target toward 8.0 per cent.

Amah (2019) examined a balance between the mix of monetary and fiscal policies to restore macroeconomic equilibrium by employing a VAR technique and found that interest rate delayed the effect of the monetary policy anchor and did not appear to have a steady relationship with lending rates.

Prabu and Ray (2019) addresses the influence of monetary policy transmission in financial markets over three distinct periods of regime changes in the Indian monetary policy and liquidity management framework. The empirical evidence showed that there is sufficient period-specific transmission of monetary policy across the different segments of the financial markets. While the transmission of monetary policy to the money and bond markets is found to be fast and efficient, the impact of the policy rates on the foreign exchange market and stock market is limited.

Ude (2018) investigates the relationship between macroeconomic variability and long-run economic growth in a panel of 40 countries over the period 1980 – 2014. The study found that, where financial credit constraints was the primary link, that there is a negative and significant correlation between macroeconomic volatility and long-run economic growth. It further refutes the negative relationship between volatility and economic growth, with the conclusion that there exist a significant and positive correlation between volatility and economic growth with reference to the sample dataset used.

Kamada and Sugo (2006) estimate a shadow rate for Japan using two intermediate variables, namely, bank lending rates and the lending attitude of financial institutions. Sun et al., (2010) found that, although the bank lending channel does play an important role in the implementation of China's monetary policy to achieve its multiple goals, a bank lending channel, an interest rate channel, and an asset price channel also exist and play an important role in transmission effect of the monetary policy using the Vector Autoregression (VAR) approach and Vector Error Correction Model (VECM). Chen et al. (2017) finds that the monetary policy transmission through bank lending channel becomes less effective in China, implying that the effectiveness of alternative channels of monetary policy transmission may change over time. Aye and Gupta (2012) examine the asymmetric effects of India's monetary policy and they find positive and negative monetary shocks exist a short time and time lag of asymmetric effects on the output. In addition, they argue the non-linear VAR model is better than the traditional linear VAR model for describing the effects of central bank's monetary policy. Thapar (2009) asserts that asymmetric effects of monetary policy completely depend on the scale of monetary shocks. In the same vein, Karras (2009) demonstrates that 18 EU countries revealed negative monetary shocks on output is statistically significant, while the positive monetary shocks are statistically insignificant.

2.3 Literature Gap and Value Addition

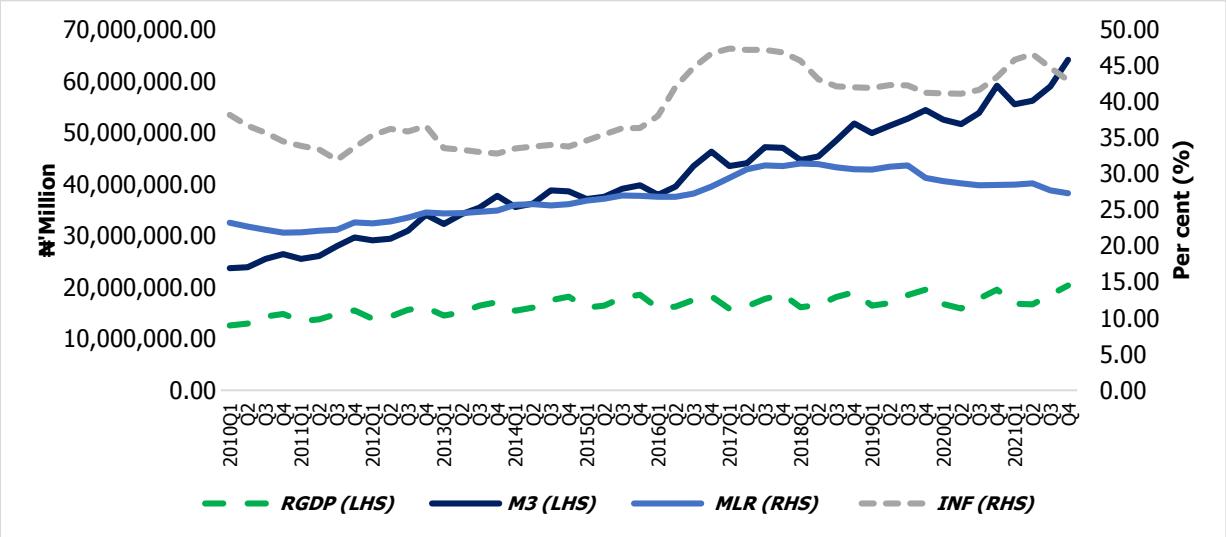
This study gives an unprecedented outlook on monetary policy transmission mechanism from a different perspective, which is the impact of the MPTM during periods of positive and negative output growth and this was constructed by incorporating dummies into the model. Other studies by (Gregor and Melecký (2018); Zhang, Tsai, and Chang (2017)) have estimated this impact with same technique, but they did not test the impact in different regimes or episodes of boom and busts in an economy. To the best of my knowledge, this is the first study in Nigeria to carry out this unique research.

2.4 The Passthrough of Interest Rate in Nigeria: A Graphical Analysis

Over the years, there appear to be some changes in the relationship between the policy rate and long-term interest rate in Nigeria, and these changes seem to have resulted following the Global Financial Crisis (2007/2008) of 2008. The interest rate transmission is evident in the MLR from the MPR till the real sector absorbs its effect in the economy. Figure 1 reveals that there exist co-movement among the primary variables. To this end, output growth is spotlighted, giving credence to the transmission of interest rate to the economy. In addition, dummy variables were

constructed to represent periods of positive and negative output growth rates and these series were incorporated in the models to provide answers to the objectives of the study. Due to the interrelationships between these variables, a correlation analysis was performed to empirically ascertain the strength, direction, and magnitude among the variables. Money supply which affects the economy through its nominal short-term interest rate has the strongest correlation (0.76), relative to MLR with a correlation of (0.68). The correlation analyses further buttress the slow transmission of MLR to output growth in Nigeria.

Figure 1: Graphical plot of M3, MLR, RGDP and INFLATION; and the Correlation between MLR & RGDP and M3 & RGDP.

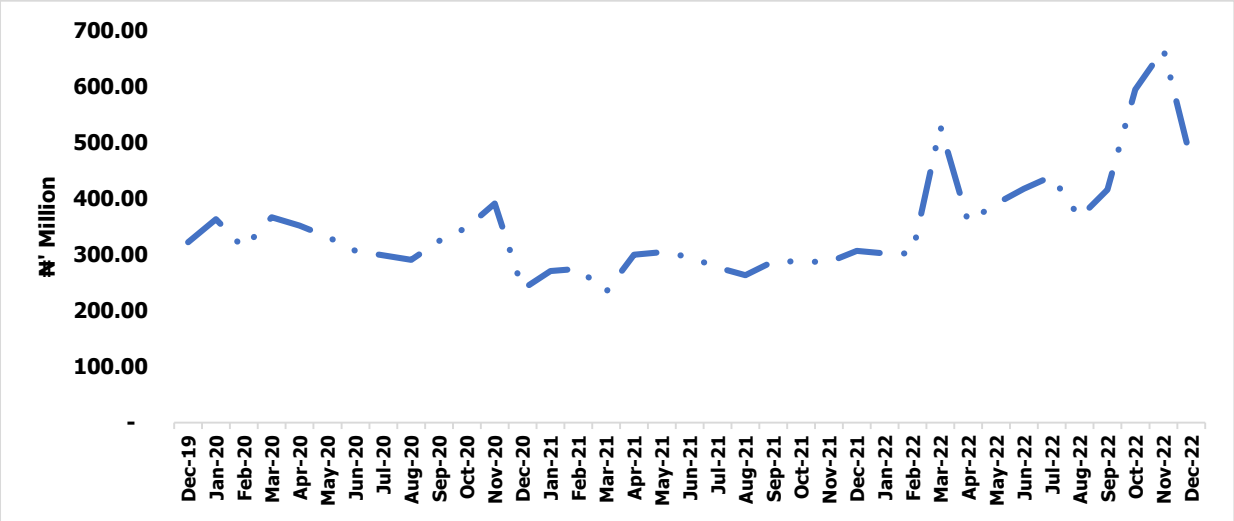


Source: NBS & CBN

MLR & RGDP	M3 & RGDP
0.68	0.76

The value of transactions is also an important indicator on how the MLR affects the larger economy. Available data shows that between December 2019 and December 2022, individuals and micro, small and medium enterprises (MSMEs) demanded for credit ranging from as low as ₦233.14 million to a high of ₦665.56 million from commercial banks but maintained an average range of ₦300.00 million within the analysed period. The slow growth in MLR illustrates the risk averse appetite of economic agents towards demanding credit from the commercial banks, even in the wake of series of economic downturns. This action has consequences for the transmission of monetary policy, which will invariably retard output growth in Nigeria.

Figure 2: Graphical Plot of the Volume of Maximum Lending Rate (MLR) in Nigeria



Source: Statistics and Banking Supervision Departments, CBN

3 METHODOLOGY

3.1 Theoretical Framework

The Taylor rule (1999) is a monetary policy rule which prescribes how a central bank should alter nominal interest rates in a systematic manner in response to changes in inflation and output, as well as other macroeconomic activities. Specifically, it stipulates that for every one per cent rise in inflation, the nominal interest rate should rise by more than one per cent.

The Taylor rule assumes the following form:

$$i_t = 2 + \pi_t + g_\pi(\pi t - \pi) + g_x x_t \qquad (1)$$

Where;

i_t = Nominal policy rate,

2 is a constant term, which is the long-run or equilibrium real rate of interest,

π^*= Central bank's inflation objective,

π_t = Current period inflation rate,

x_t = Current period output gap,

G_π and g_x are parameters to be estimated.

The Taylor's rule assumes that the central bank's inflation target remains unchanged at 2.0 per cent, and overtime there is an improvement in monetary policy because the central bank has responded more vigorously to deviations of inflation from the 2.0 per cent value, by increasing the magnitude of coefficient g_π on the inflation term $(\pi t - \pi)$ (Hetzel, 2000). The central bank aims at stabilising inflation around its target level, while output around its potential. Positive deviations of the two variables from their target or potential level would be associated with a tightening of monetary policy, while negative deviations would be associated with loosening of monetary policy (Hofmann and Bogdanova, 2012).

The output gap is further illustrated with the following:

$$x_t = -?\,(i_t - \pi_t - r) + U_t \quad (2)$$

$$\pi_t = \pi_{t-1} + \lambda x_{t-1} + e_t \quad (3)$$

$$i_t = g_0 + g_\pi \pi_t + g_x x_t \quad (4)$$

Equation (2) is the IS function which relates the output gap to the real rate of interest. The Philip curve is illustrated in equation (3), and it relates inflation to the output gap. The reaction function of the central bank is captured in equation (4) and it takes the form of the Taylor rule.

3.2 Data

We employ quarterly data, covering the 2010Q1 – 2022Q4, and sourced from Statistics Department of the CBN, in this study. These variables include the Maximum Lending Rate (MLR), which captures the lending rates of Banks; the Broad Money Supply (M3); year-on-year Headline Inflation (INF); Real Exchange Rate (RER); All Share Index (ASI) and Real GDP (RGDP). M3 and RGDP are transformed into their natural logarithm and relabeled as M3G and RGDPG, respectively. M3G and RGDPG are reflective of how money flows through to the economy, which is determined by the short-term nominal rate and how it affects the level of total output in the economy, respectively, and these are key determinants of how the passthrough of interest rate is manifested in the real sector of the economy. Consequently, the dataset of GDP was extrapolated until 2010, when GDP was rebased and data was published by the National Bureau of Statistics (NBS), hence the main reason the scope of the data began from 2010. The scope of the data is strictly based on the availability of data.

3.2 Technique of Analysis

The study utilises the framework of a co-integrated Autoregressive Distributed Lag (ARDL) model, as proposed by Pesaran et al (2001), in both its linear and non-linear forms. The ARDL is a time series model, which incorporates lags of both the dependent and independent variables in its estimation. It is effective in measuring level relationships among variables that are integrated of different orders. This technique has been utilised in measuring interest rate passthrough by various studies ((Gregor and Melecký (2018); Zhang, Tsai, and Chang (2017)), with satisfactory outcomes.

In its level form, the proposed ARDL model in this study is:

$$RGDPG_t = a_0 + \sum_{i=1}^{o} a_{1i} RGDPG_{t-i} + \sum_{i=0}^{p} a_{2i} M3G_{t-i} + \sum_{i=0}^{q} a_{3i} MLR_t^{+gdpr} + \sum_{i=0}^{r} a_{4i} MLR_t^{-gdpr} + \sum_{i=0}^{x} a_{5i} INF_t + \sum_{i=1}^{t} a_{6i} EXR_t + \sum_{i=1}^{v} a_{7i} ASI_t + e_t \quad (5)$$

Where $a_{1\ to\ 6}$ are coefficients of the level relationships, $o, p, q, r, x, t\ and$ v are the optimum lag specifications for RGDPG, M3G, MLR_t^{+gdpr}, MLR_t^{-gdpr}, INF, EXR and ASI, respectively, which are determined based on the akaike information criteria (AIC), and e_t is the error term. Equation 5 can be expressed in a co-integrating form to capture both the short- and long-run dynamics in the relationship between RGDPG and other variables of the model.

$$\Delta RGDPG_t = \emptyset_0 + \sum_{i=1}^{c} \emptyset_{1i} \Delta RGDPG_{t-i} + \sum_{i=0}^{d} \emptyset \Delta M3G_{t-i} + \sum_{i=0}^{f} \emptyset_{3i} MLR_t^{+gdpr} + \sum_{i=0}^{g} \emptyset_{4i} MLR_t^{-gdpr} + \sum_{i=0}^{h} \emptyset_{5i} \Delta INF_{t-i} + \sum_{i=1}^{j} \emptyset_{6i} \Delta EXR_{t-i} + \sum_{i=1}^{m} \emptyset_{7i} \Delta ASI_{t-i} + \delta\big(RGDPG_{t-1} - c - b_1 M3G_{t-1} - b_2 MLR_t^{+gdpr} - b_3 MLR_t^{-gdpr} - b_4 INF_{t-1} - b_5 EXR_{t-i} - b_6 ASI_{t-i}\big) + \varepsilon_t \quad (6)$$

Here, Δ means difference operator, $c, d, f, g, h, j \; and \; m$ are the optimum lags for RGDPG, M3G, MLR_t^{+gdpr}, MLR_t^{-gdpr}, INF, EXR and ASI in the short-run, respectively, $\emptyset_{1\ to\ 7}$ are the short-run coefficients, which capture the short-run dynamics in the relationship under investigation, and the coefficients $b_{1\ to\ 6}$ are the long-run coefficients. While ε_t is the error term in the co-integrating model, the parameter δ is the speed of adjustment, and it measures the speed at which equilibrium is restored in the long-run among the co-integrating variables.

The Bounds test is conducted under the null hypothesis of "no level relationship", using the Wald test:

$b_1 = b_2 = b_3 \ldots = b_6 = 0$

Under the null hypothesis, when the test statistic lies above the upper bound at a chosen level of significance, the null hypothesis is rejected, and if it lies below the lower bound, it cannot be rejected. However, if it lies within the upper and lower bound at a chosen level of significance, the test is inconclusive.

3.2.1 The Non-linear ARDL Framework

The non-linear form the proposed model is designed to evaluate the interest rate transmission mechanism under two episodes/regimes: Episodes/regimes of positive and negative output growth in Nigeria. To do this, we disaggregate the impact of the MLR into the two regimes of output growth in Nigeria. The regime of positive output growth captures all the periods that Nigeria experienced output growth greater than zero (0), while the negative output growth reflects all the observations for which the annual output growth fell below zero (0).

Equations 3 and 4 are the level and cointegrating forms of the proposed non-linear ARDL model, respectively.

$$RGDPG_t = a_0 + \sum_{i=1}^{o} a_{1.i} RGDPG_{t-i} + \sum_{i=0}^{p1} a_{2a.i} I * MLR_{t-i} + \sum_{i=0}^{p2} a_{2b.i}(1-I) * MLR_{t-i} + \sum_{i=0}^{q} a_{3.i} M3G_{t-i} + \sum_{i=0}^{r} a_{4.i} INF_{t-i} + \sum_{i=0}^{x} a_{5.i} EXR_{t-i} + \sum_{i=0}^{z} a_{6.i} ASI_{t-i} + e_t \quad (7)$$

$$\Delta RGDPG_t = a_0 + \sum_{i=1}^{o} a_{1.i} \Delta RGDPG_{t-i} + \sum_{i=0}^{p1} a_{2a.i} \Delta(I * MLR)_{t-i} + \sum_{i=0}^{p2} a_{2b.i} \Delta((1-I) * MLR_{t-i} + \sum_{i=0}^{q} a_{3.i} \Delta M3G_{t-i} + \sum_{i=0}^{r} a_{4.i} \Delta INF_{t-i} + \sum_{i=0}^{x} a_{5i} \Delta EXR_{t-i} + \delta(MLR_{t-1} - c - b_{1.1} I * MLR_{t-1} - b_{1.2}(1-I) * M3G_{t-1} - b_2 INF_{t-1} - b_3 EXR_{t-1} - b_4 ASI_{t-1}) + \varepsilon_t \quad (8)$$

All the variables and parameters in equations 3 and 4 are as defined in Equations 1 and 2, respectively, except for the I,\ the regime-determining dummy, which takes the value 1, if RGDPG>0 and, 0 if RGDPG≤ 0. Consequently, the corresponding parameters $a_{2a.i\ to\ p1}$ and $a_{2b.i\ to\ p2}$ captures the impacts of the interest rate channel of MPTM in the regimes of positive and negative output growth on output growth in Nigeria, respectively. Similarly, in the cointegrating equation, the parameters $b_{1.1}$ and $b_{1.2}$ are the long run coefficients of the interest rate passthrough, in the regime of positive and negative output growth on output growth in Nigeria.

For robustness, we evaluate the stability of the model using the CUSUM test to enhance the reliability of the inferences drawn from its estimates. Also, the estimated models are tested for the presence of serial correlation, heteroskedasticity, within the framework of the Breusch-Godfrey Serial Correlation LM Test, Breusch-Pagan-Godfrey Heteroskedasticity Tests.

4 RESULTS AND DISCUSSION OF FINDINGS

Table 1: Descriptive Statistics

Statistics	RGDP	M3	MLR	EXR	ASI
Mean	16488889	24656508	26.84007	287.8175	31049.81
Median	16444463	21676955	26.90257	276.0363	30504.14
Maximum	20329062	43818475	31.44447	525.17	42716.44
Minimum	12583478	10961596	21.84764	152.4922	20373
Std. Dev.	1788996	9274278	3.025672	126.2435	6697.48
Skewness	-0.09484	0.241649	-0.05193	0.31322	0.180917
Kurtosis	2.545128	1.946669	1.820254	1.606458	1.836535
Jarque-Bera	0.485781	2.686168	2.805175	4.668776	2.96915
Probability	0.784357	0.261039	0.24596	0.09687	0.226599
Observations	48	48	48	48	48

Source: Authors computation

Table 1 depicts the result of the descriptive statistics of the study. All the variables in the model are normally distributed and this is revealed by the probability values of the Jarque-bera statistics. The null hypothesis states that if the probability value of the Jarque-bera statistics is greater than 5 per cent (>0.05), we reject the null hypothesis and conclude that the variable is normally distributed.

4.1 Pre-estimation Tests

We begin the presentation of the results by analysing the unit root properties of the variables of the proposed models. The results in Table 1 shows, at levels, only INF is stationary, as the null hypotheses of unit root, for the ADF tests, is rejected at the 10 per cent level of significance, while the null hypothesis of stationary cannot be rejected in both the PP and KPSS tests. However, all the other variables, RGDP, M3, MLR, EXR and ASI, are first difference stationary.

This confirmed by the significant ADF and PP statistics, and the insignificant KPSS statistics, at first difference, for each of the variables. Consequently, while INF is stationary, RGDP, M3, MLR, EXR and ASI are integrated or order 1, justifying their inclusion in the proposed ARDL frameworks.

Table 1: Unit Root Tests

		RGDPG	M3G	MLR	INF	EXR	ASI
AT LEVELS	**ADF**	-1.46^	1.09^	-1.61^	-2.70*	0.29^	-1.56^
	PP	-3.31**	2.07^	-1.24^	-1.87^	0.08^	-1.86^
	KPSS	0.82***	0.90***	0.73**	0.27^	0.82***	0.25^
AT FIRST DIFFERENCES	**ADF**	-1.73*	-4.85***	-4.07***	-3.54***	-4.54***	-5.81***
	PP	-11.98***	-7.22***	-4.13***	-3.42**	-4.84***	-5.80***
	KPSS	0.22***	0.07^	0.16**	0.07^	0.07^	0.08^

Note: ***significant at 1%, **significant at 5%, *significant at 10%, and ^insignificant.
Source: Staff Estimates

4.2 Results of the Models

4.2.1 The NARDL Model of MLR Results

The results of the non-linear ARDL model (Table 2) shows that the variables of the model are cointegrated, as the F-statistics of 19.82 is greater than the upper bound of its critical value, at the 5 per cent level of significance. Consequently, the resulting short- and long-run relationship are captured by the cointegrating ARDL. In the short-run, the interest rate passthrough is negative but only significant in the first lag. The result suggests that the passthrough of MLR_t^{+gdpr} to RGDPG is low, standing at about -0.39, in the first lag, which is the passthrough of interest rate during periods of positive output growth, meaning that banks transmit less than 0 per cent of changes in the MPR into the lending rate in the following quarter. The autoregressive term, that is the lag of RGDPG, is also negative, but insignificant, suggesting the future output growth rates are determined by current values of the RGDPG. The error correcting term or speed of adjustment is negative and statistically significant (-0.99), implying that about 99.5 per cent of disequilibrium is corrected every quarter.

In the long-run, the RGDPG appears to be positively driven by INF, LEXR and LASI. Specifically, the passthrough of LASI to RGDPG is high, standing at about 2.78, positive, but statistically insignificant, while the impact of LEXR to RGDPG is equally positive, but statistically insignificant. This finding is in line with theoretical postulations, as LASI is reflective of capital formation and wealth creation through investments and to a large extent reflects the state of the economy, and its productive prowess, as listed companies on the Exchange become profitable, it leads to both increase in taxes to the government, as well as production/output growth in the economy. Consequently, LEXR, which is a measure of the real exchange rate - the change in the domestic exchange rate is positive, which depicts an appreciation in the naira, which could mean that the demand for the domestic currency is high, which would invariably lead to increased investment and growth in output. However, MLR_t^{+gdpr} is found to be inversely related to RGDPG, suggesting that during the regime of positive output growth, the transmission of interest rate to the real sector of the economy is negative in the long-run.

The estimated ARDL model appears to robust in capturing the specified relationship, as the results of the Breusch-Godfrey Serial Correlation LM, and Breusch-Pagan-Godfrey Heteroskedasticity Tests suggest that the null hypotheses of "no serial correlation" and "homoskedasticity", respectively, cannot be rejected at 5 per cent level of significance. In addition, the CUSUM test (Appendix) suggest that the estimated model is relatively stable, as the plotted CUSUM points appear to fluctuate randomly around zero, and lying within the control limits of 5 per cent confidence intervals.

Table 2: Non-linear ARDL Model (NARDL)

Short-run			**Long-run**		
Variable	**Coefficient**	**p-value**	**Variable**	**Coefficient**	**p-value**
D(RGDPG(-1))	-0.99	0.00	**M3G**	-0.02	0.79
D(M3G(-1))	-0.02	0.79	**MLR_RGDPG1**	**-0.40**	**0.28**
D(MLR_RGDPG1(-1))	**-0.39**	**0.33**	**INF**	0.10	0.70
D(INF(-1))	0.10	0.69	**EXR**	2.10	0.56
D(EXR(-1))	-11.51	0.07	**ASI**	2.78	0.18
D(ASI(-1))	-8.21	0.03	**C**	-27.82	0.18
CointEq(-1)*	-0.99	0.00			

Bound Test					
F-Statistic		**Upper Bound**	**Lower Bound**		
19.82	10%	1.99	2.94		
	5%	2.27	3.28		
	2.50%	2.55	3.61		
	1%	2.88	3.99		
Serial Correlation Test					
F-statistic	2.12	P-value	0.16		
Heteroskedasticity Test					
F-statistic	1.62	P-value	0.13		

Source: Staff Estimate

4.2.2 The Non-linear ARDL Model of RGDPG Results

Table 3 presents the results of the non-linear ARDL model, which attempts to evaluate the transmission mechanism of interest rate in Nigeria, under varying states of real GDP growth/output growth. Again, the variables of the models are cointegrated, as the F-statistics of 19.82 is greater than the critical value of its upper bound, at 5 per cent level of significance. The error correcting term of -0.99, which is negative and statistically significant, suggests that only about 99.5 per cent of disequilibrium is corrected every quarter. As suggested by the ARDL model, future output growth rates are influenced by current values of the rate, as the autoregressive term, that is the lag of RGDPG, is also negative and significant.

The long-run interest rate passthrough is found to be low, negative, and statistically insignificant, in both the regimes of positive and negative GDP. However, the passthrough is higher (-0.40) in the regime of positive output growth than that of negative output growth (-0.60), though the difference is negligible. This result suggests that the passthrough of interest rate during both regimes decreases the level of changes in the MLR which is transmitted to output growth in the following quarter by banks in Nigeria. During the regime of positive output growth, the business cycle of the economy is in its boom state; there is a rise in investments and productivity by the private sector and taxes for the government. Consequently, the passthrough of interest rate in this regime will be low, slow and negative, due to the positive state of the health of the economy. When there is positive output growth, a small change in the policy rate is transmitted through the MLR at lower levels to output growth, which is inimical to output in the long run. On the impact of INF, EXR and ASI on real GDP growth, findings from the cointegrating non-linear ARDL reveals that INF, EXR and ASI are drivers of RGDPG. However, M3G appears to have negative impact on RGDPG, and this is in line with theory as money supply growth to the economy will be negative due to low, slow and negative transmission of interest rate during both regimes.

Consequently, during the regime of negative output growth, the business cycle of the economy is in its bust state, a trajectory that could lead to periods of economic downturns, such as recession. In this regime, the transmission of monetary policy is equally low, slow and negative, as banks will be averse to lend to the private sector, a decline in productivity, as well as the fall in taxes to the government. When there is negative output growth, a small change in the policy rate is transmitted through the MLR at lower levels to output growth, which is inimical to output in the long run. On the impact of INF, EXR and ASI on real GDP growth, findings from the cointegrating non-linear ARDL reveals that INF, EXR and ASI are drivers of RGDPG. Again, the estimated model appears to be robust in evaluating the passthrough of interest rate, as specified in the non-linear ARDL framework, as the resulting the Breusch-

Godfrey Serial Correlation LM, and Breusch-Pagan-Godfrey Heteroskedasticity Tests suggest the absence of serial correlation and heteroskedasticity, respectively, while the CUSUM tests (Appendix) suggest relative stability in its parameters.

Table 3: Non-linear ARDL Model (NARDL)

Short-run			**Long-run**		
Variable	**Coefficient**	**p-value**	**Variable**	**Coefficient**	**p-value**
D(RGDPG(-1))	-0.99	0.00	**M3G**	-0.02	0.79
D(M3G(-1))	-0.02	0.79	**MLR_RGDPG2**	**-0.60**	**0.20**
D(MLR_RGDPG2(-1))	**-0.23**	**0.00**	**INF**	0.10	0.70
D(INF(-1))	0.10	0.69	**EXR**	2.10	0.56
D(EXR(-1))	2.09	0.58	**ASI**	2.78	0.18
D(ASI(-1))	2.77	0.19	**C**	-27.82	0.18
CointEq(-1)*	-0.99	0.00			
Bound Test					
F-Statistic		**Upper Bound**	**Lower Bound**		
19.82	10%	1.99	2.94		
	5%	2.27	3.28		
	2.50%	2.55	3.61		
	1%	2.88	3.99		
Serial Correlation Test					
F-statistic	2.12	P-value	0.16		
Heteroskedasticity Test					
F-statistic	1.62	P-value	0.13		

Source: Staff Estimate

5 CONCLUSION AND POLICY RECOMMENDATIONS

The evaluation and re-examination of monetary policy transmission mechanism is important to every monetary authority or central bank. The passthrough of monetary policy rate to lending rate (MLR), which measures how changes in the policy rate are transmitted to cost of funds, tacitly, provides a gauge for the efficacy of monetary policy. As expected, and in line with the interest rate channel of monetary policy transmission mechanism, the MPR, being the anchor rate, is transmitted to the lending rate, and this, in turn, determines level of output. However, the degree of the passthrough of interest rate appears to be sensitive to structural factors in an economy, as studies have shown that inflation, economic growth, among other factors, tend to vary the impact of the anchor rate on long-term real interest rates.

This study re-examines the interest rate transmission mechanism in Nigeria into two regimes of positive and negative output growth, against the backdrop of the contemporary macroeconomic conditions in the economy, which has seen the GDP slip into the negative territory in seven (7) quarters from 2016 till date. Hence, the need to incorporate dummy variables that would simulate and split the regimes into two episodes of positive and negative periods of output growth in Nigeria. Findings from this study suggests that during both periods

of positive and negative output growth, the passthrough of interest rate to the real sector is weak and this would undermine the transmission of monetary policy in Nigeria. Consequently, where the effectiveness of monetary policy is measured by the degree of which the MPR transmits to long-term rates, then it could be argued that monetary policy would be more effective in the long run, and in the regime of positive output growth than in the regime of negative output growth. This is due to the positive regime presenting the lowest negative coefficient and is likely to transmit the passthrough of interest rate faster, relative to the regime of negative output growth. However, this hampers the ultimate target of the CBN, which is to support output growth alongside stable prices in the economy.

In Nigeria, insecurity, power outage, among other structural factors, have also been argued to increase the overhead cost of banks, therefore, commercial banks seeking to lower the impact of the high overhead costs, tend to transfer these costs to potential borrowers in the form of higher lending rates, which serves as a disincentive for the passthrough of interest rate to the real sector. As shown in figure 2, the growth in MLR in commercial and merchant banks is 45.1 per cent from December 2019 to December 2022, even in the wake of the COVID-19 Pandemic, recession, and the Russia-Ukraine war. Consequently, structural factors must be addressed by fiscal policies, which would invariably bridge the gap between the policy rate and the MLR, as well as enhance the transmission mechanism of the interest rate channel in Nigeria.

This study therefore concludes that the interest rate passthrough for Nigeria is negative, slow, and weak, and this could be seen in the value of the MLR transactions, overhead cost of banks, and other structural factors. It is therefore recommended that both fiscal and monetary policies should be fused and harmonised to develop and execute initiatives aimed at the rebuild of structural factors, such as infrastructures and security, which on the path of the government, to generate and sustain rapid economic growth is deciding on the sector for resource allocation. The government could decide this by selecting a sector with comparative advantage, but the key to rapid growth is using the output of that sector to unlock growth in other sectors. Consequently, a more appropriate way is for the government to ensure adequate resource allocation by creating an enabling environment for business competition and equipping labour with the right skills to keep up with the rapidly changing economy.

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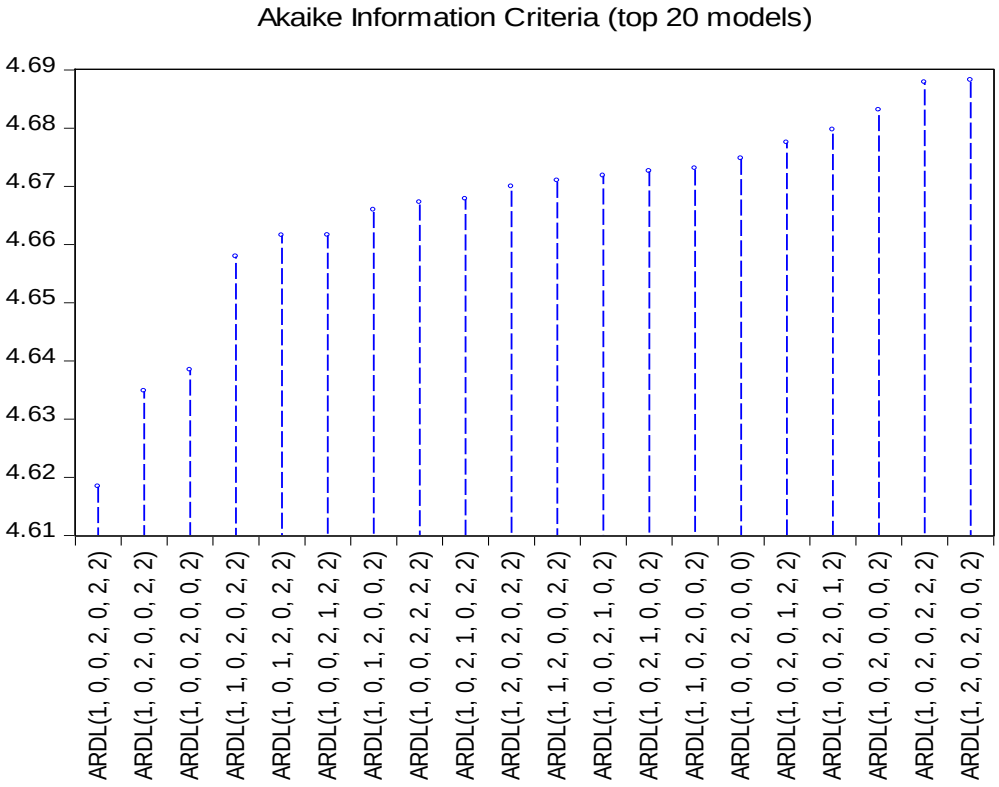
APPENDIX


Akaike Information Criteria (top 20 models)
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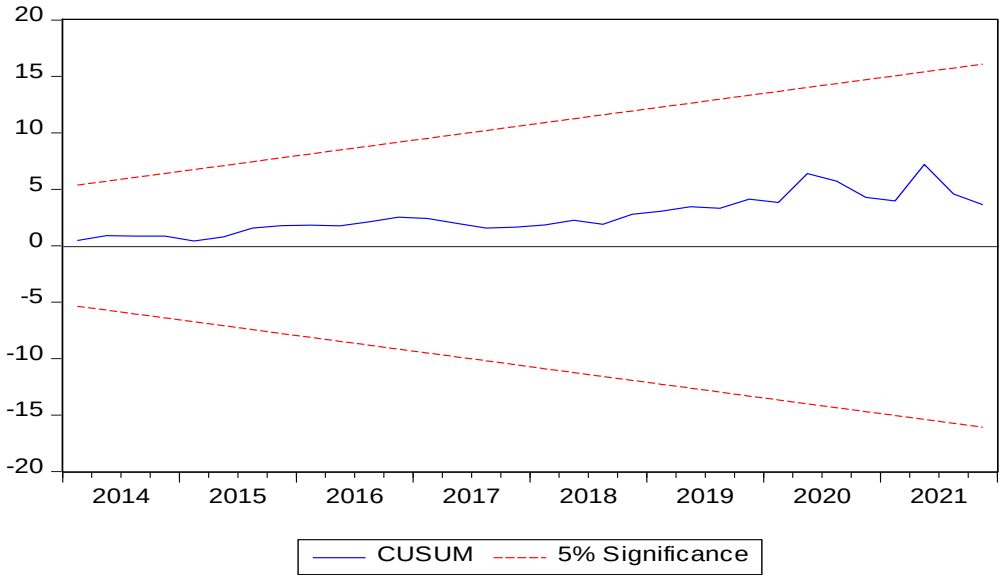
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