



Examining the Feasibility of inflation targeting approach as a monetary policy framework in Nigeria

Akinboyo O Lawrence

Monetary Policy Department, Central Bank of Nigeria, Abuja, Nigeria

* Corresponding Author: Akinboyo O Lawrence

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Abstract

This study evaluates the feasibility of the adoption of the inflation-targeting approach to monetary policy in Nigeria. In this bid, the paper relied on literature on selected conditions needed for a successful implementation of IT. The study evaluated some of the necessary preconditions for IT, particularly the autonomy in decision-making conditions, the absence of fiscal dominance, as well as empirically testing the preconditions that necessitates the need for a predictable relationship between inflation and monetary policy variables. To empirically test the relationships, we utilized the vector autoregressive (VAR) estimation technique, as well as a granger causality test to examine the nature of the relationship between the variables. The estimation results show that fiscal spending shock has the highest percent of innovations in actual inflation, followed by money supply (M2) in the system. Also, the causality test reveals that fiscal spending causes persistent price increase in Nigeria, thereby suggesting the possible limitations for monetary policy tools in attaining the price stability objective of the Central Bank of Nigeria. Therefore, the study recommends the implementation of inflation targeting in Nigeria, as an optimal monetary policy framework.

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1. Introduction

Since the 1990s, quite a significant proportion of developing and emerging market economies have opted for the use of inflation targeting (IT) framework for their monetary policy. The defining characteristics of this framework are its unambiguous obligation by a Central Bank to have an inflation index that mirrors a periodically adjusted given target, as well as the utilization of inflation forecast to set intermediate policy targets. IT regimes emphasize high-level transparency, continuous public engagement on inflation, and policy decisions of the Central Bank. Two distinguishing features of IT are the primacy of the stability of price and the quest for an effective futuristic target.

Since current expectations influence future inflation trends, the Central Bank can therefore alter expected inflation trends with its current monetary policies and conditions to achieve a given target. IT outlines clear monetary policy goals, responsibilities, as well as encourages transparency and accountability (Svensson, 1999)^[25]. Duman (2002)^[14] posits that the strength of inflation targeting over other monetary policy regimes such as exchange rate targeting, provides more autonomy to respond to both domestic and foreign shocks. The applicability of inflation targeting, therefore, depends on the possibility to pick an inflation target that is feasible and realistic.

As identified by the experience of early adopters, using the case of 13 emerging market economies that adopted IT between 1997 to 2002, Batini *et.al.* (2005)^[7] presented an optimistic scenario on the gains of the adoption of the IT framework. They opined that these countries stabilized inflation following the adoption of IT better than a control group of emerging economies that did not adopt IT. They also noted that the IT countries at the time had not fully met all necessary pre-conditions for IT but were able

to practice some form of pseudo-IT while improving their economic conditions to meet all necessary conditions to fully maximize their IT framework. Conceptually, there are three forms of IT adoption frameworks. (i) Full Fledge IT (FFIT), when a country has met all necessary preconditions for the adoption of IT and pursues IT as an exclusive anchor for macroeconomic stability. (ii) Eclectic IT (EIT), when a country adopts IT in conjunction with other policy objectives in a stable economic environment, albeit, not as accountable and transparent as in FFIT. (iii) Inflation Targeting Lite (ITL), when a country adopts IT in a less stable macroeconomic environment, with a low level of accountability and transparency in a bid to use the framework to improve its economic environment, transparency, and accountability to a level where it can adopt FFIT. In essence, ITL is a transitory framework to prepare a country that has not met the preconditions for FFIT for the adoption of FFIT (see, Aliyu and Englama, 2009) ^[3]. Angeriz and Arestis (2007) argue that FFIT is not possible in ITL countries which are mostly emerging economies because of underdeveloped monetary and financial systems, weak fiscal position characterized with high debt ratios, inadequate transparency in monetary policy operation and implementation, and shock vulnerability (particularly supply shocks).

The consideration for the possibility of the adoption of the IT approach to monetary policy in Nigeria commenced mostly in 2000. Uchendu (2000) ^[27] confirmed Nigeria's interest in the adoption of the IT approach. Since then, several efforts have been devoted to ensuring the feasibility of adopting this framework. For example, Adebisi and Adeyemi (2008) ^[1] investigated inflation targeting possibilities for developing countries using the case of Nigeria by utilizing data from 1960 to 2014. In their model, they used narrow money (M1) as money supply proxy and concluded that Nigeria had not met the necessary preconditions for the adoption of IT. In a similar study, Aliyu and Englama (2009) ^[3] using data from 1986 to 2006 and broad money (M2) as their proxy for money supply, concluded that Nigeria had not met the necessary preconditions for the adoption of IT. However, Akuns et.al, (2016) ^[2] examined the sustained importance of IT, using data from Nigeria from 1996 to 2014. They simulated implications for key macroeconomic variables within two different frameworks: Nominal GDP targeting and IT. They suggested a preference for nominal GDP targeting on the basis that FFIT is not agreeable to a multiple-objective monetary policy.

This study however seeks to examine the preparedness of Nigeria in adopting the inflation-targeting approach to monetary policy as a policy option for Nigeria. In this bid, the paper will evaluate how well Nigeria is meeting selected preconditions for the successful implementation of IT and based on that, conclude on the feasibility of Nigeria adopting IT. The major preconditions of interest in this study are Central Bank independence status, the accuracy of inflation forecasting, and the relationship between inflation and monetary policy instruments. In empirically exploring one of the preconditions for IT that necessitates a relationship between inflation and monetary variables, the study adopted the vector autoregressive (VAR), as well as a causality test to understand key determining factors of inflation for Nigeria. A major deviation from the previous works of Adebisi and Adeyemi (2008) ^[1], Aliyu and Englama (2009) ^[3], and Akuns et.al (2016) ^[2] is that most of these studies utilized data from both military and democratic regimes, thereby lumping

effects of the different regimes. One criterion crucial for the adoption of IT is a sound macroeconomic and political environment that affords the Central Bank adequate independence and autonomy, a characteristic that is absent from military regimes. In addressing this challenge, we utilized data from 2000 on the basis that Nigeria returned to a civilian regime in the second quarter of 1999. We left out the last 2 quarters of 1999 for fear of military overhang in practices of the government and the Central Bank.

Following this introduction, the second section provides some stylized facts, while the third presents relevant theoretical and empirical literature on the subject matter. The fourth section presents the adopted methodology, empirical analysis, and findings of the study, and finally, the fifth presents the conclusion and recommendations of the study.

2. Stylized Facts

The core mandate of the Central Bank of Nigeria (CBN) is the promotion of monetary and price stability as articulated in the 2007 CBN Act. Over the years, the Bank has sought to accomplish its mandate through several monetary policy measures, specifically managing interest rate, exchange rate, and inflation. In doing this, it applies monetary policy frameworks which could be described as the strategies for the formulation and implementation of monetary policy. The fundamental characteristics of a monetary policy framework include the primary objective that is set for the central bank, the intermediate policy target, the operating target(s), and the institutional framework that is used for monetary policy conduct.

Nigeria began the implementation of her monetary policy with an exchange rate targeting framework from 1959 to 1973. Since 1974, monetary targeting remained the framework for the implementation of monetary policy in Nigeria. The operating and intermediate targets are used in identifying the optimal level of money stock, necessary for an expected level of output growth rate, money demand function, and objective of achieving low and stable inflation. A new monetary policy implementation framework was introduced in December 2006. Under that framework, reserve money remained the operating target and was later combined with the overnight interbank interest rate with the introduction of the Monetary Policy Rate (MPR). The characteristics of the current framework are:

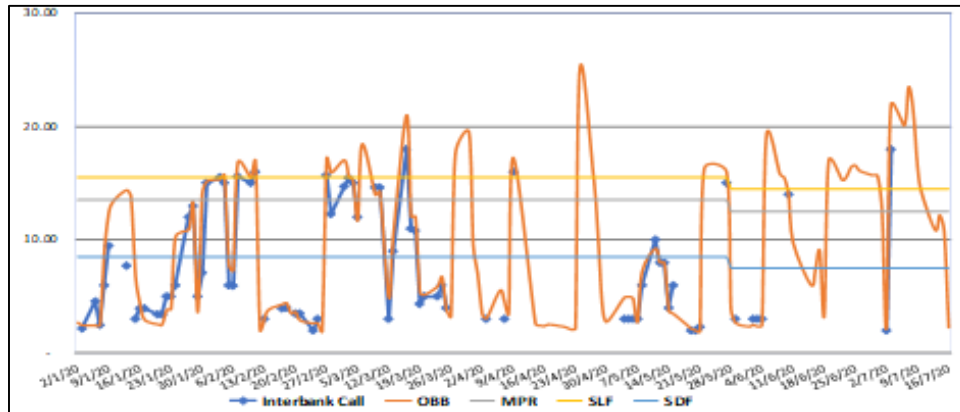
- The Monetary Policy Rate (MPR) replaced the Minimum Rediscount Rate (MRR) as the anchor rate, with a corridor;
- The operating target is to influence the overnight interbank interest rate;
- The transmission variables are largely the level and structure of interest rate;
- The intermediate targets include broad money, amongst others; and
- The ultimate goal is to maintain low and stable inflation as well as maintain a stable value of domestic currency.

The new monetary policy implementation framework is aimed at addressing the persistent interest rate volatilities in the short end of the market; ensuring the responsiveness of overnight rate to policy rate changes; and attaining monetary targets (M2). It involves averaging of reserve requirement over a maintenance period, and the use of Standing Facilities (Lending and Deposit) to define an interest rate corridor that would drive interest rates in the money market. Conceptually,

banks are expected to quote their overnight interest rate as a ratio of the MPR.

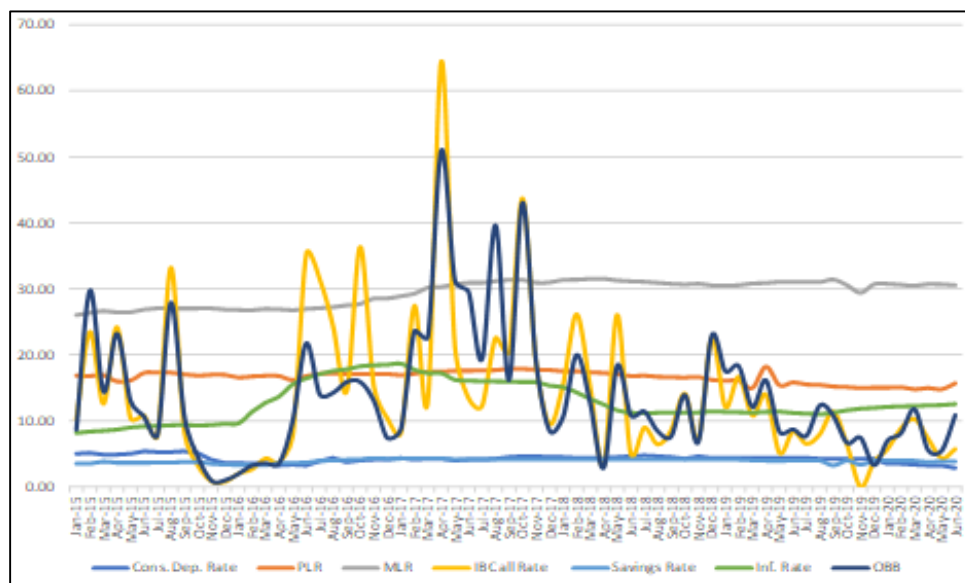
Recent macroeconomic and financial developments, however, have shown that the current framework does not seem to be achieving the expected policy outcomes. For instance, available data from 2015 reveals that under the current framework, the relationship between the Bank's nominal anchor, the MPR, and its intermediate target, the

interbank rate (IBR), has virtually collapsed. On the corridor system, the Bank has been implementing a hybrid (multi-instrument) monetary policy strategy within an interest rate corridor since 2007, yet the corridor system - Standing Lending Facility (SLF) and Standing Deposit Facility (SDF) - have not succeeded in stabilizing the short-term interest rates nor support effective monetary policy implementation (figures 2.1 and 2.2).



Source: Financial Market Dept., CBN 2022

Fig 1: Daily Money Market Rates (percent) (January 2, 2020 – July 16, 2020)



Source: Statistics Dept., CBN 2022

Fig 2: Monthly Weighted Average Lending, Deposit, Call, and OBB Rates (January 2015 – June 2020)

A review of most of the monetary aggregates also revealed that they performed below their set targets. For instance, the composition of the Central Bank liquidity position like broad money (M3) which is an important component of the policy stance, has often been subjected to rigorous scrutiny as it continued to perform below the benchmark. This implies that the monetary targeting framework has been unable to influence financial conditions, which in turn affect aggregate demand and ensure the growth of the economy. This shows

that policy rate which boosts aggregate demand in the economy through profitable uses by the banks to either increase or decreases the quantity of reserve money demanded is not effective to sustain the price stability objective of the Bank and ensure the growth of the economy. As shown in Figure 2.1, the interbank call and Open Buy Back (OBB) rates have become increasingly volatile and largely outside the upper band of the standing facilities corridor over the past few months like in previous years.

Table 1: Monthly monetary aggregates growth over preceding December

| Aggregate | Dec. 19 | Jan. 20 | Feb. 20 | Mar. 20 | Apr. 20 | May. 20 | June. 20 | Annualized | % Provisional Benchmark for 2020 |
|--------------------------------------|---------|---------|---------|---------|---------|---------|----------|------------|----------------------------------|
| Broad Money (M3) | 6.22 | (1.84) | (2.34) | 2.60 | 2.88 | 2.72 | 1.64 | 3.27 | 11.74 |
| NFA | (50.97) | 14.83 | (2.62) | 10.29 | 1.87 | 11.55 | 30.54* | 61.07 | (24.66) |
| NDA | 38.62 | (5.18) | (2.28) | 1.06 | 3.08 | 0.95 | (4.15) | -8.30 | 19.04 |
| Aggr. Credit (Net) | 27.15 | (1.00) | 1.26 | 5.16 | 8.38 | 7.47 | 5.16 | 10.33 | 16.85 |
| Credit to Private Sector | 13.42 | (0.48) | (0.11) | 6.07 | 7.82 | 9.49 | 9.32 | 18.65 | 14.94 |
| Of which: Core Private sector | 15.27 | (0.10) | (0.02) | 6.30 | 7.29 | 8.08 | 6.57 | 13.15 | |
| Credit to Govt. | 92.89 | (2.47) | 5.09 | 2.62 | 9.96 | 1.78 | (6.54) | -13.09 | 22.21 |
| Other Items (Net) | (37.70) | 68.83 | 49.81 | 68.52 | 79.89 | 96.30 | 109.48 | 218.97 | 8.09 |

Source: Statistics Dept., CBN 2022

In light of the foregoing, it can be inferred that the current monetary targeting framework is becoming less efficient in tracking monetary developments, changes in price levels, and the achievement of the Bank's price stability mandate. There is, therefore, the need to reassess the efficacy of the existing monetary policy framework of the Bank towards either re-strategizing the existing framework or reviewing the current monetary policy strategy in light of other competing alternatives on the appropriate monetary policy framework suitable for effective management of interest rates, money supply, and prices, with feedback effect on aggregate demand and output growth. This is the main motivation for this study.

3. Literature Review

3.1 Theoretical Literature

Expectations play a critical role in the practice of inflation targeting (IT). Economic agents form expectations around the preannounced targets of inflation. It is expected that these expectations will be fused into contracts, pricing behaviors, and consensus in collective bargaining. These variations in expectations and futuristic institutional provisions connect the inertial inflation component (inflationary pressures arising from preceding inflation rates) to the inflation target. The framework of IT regime is built on the premise that monetary policy will be more predictable and that central banks will be more credible. Credibility is the central bank's ability to anchor medium to long-term expectations, as well as avoid expectation traps that may lead to price instability. Strict adherence to IT suggests a form of rule-based central banking in which there is little or no space for the exercise of discretion. The dynamic inconsistency of monetary policy first advanced by Kydland and Prescott (1977) ^[18], provides the theoretical basis on why the discretionary scope of central banking is limited. In its attempt to attain short-run objectives, policymakers, inadvertently increase inflation over a socially acceptable limit. Rational individuals adjust expectations given discretionary variations in monetary policy, as such, eradicating any long-run effect on the real economy. Rules are preferred in that they remove the possibility that policymakers will incorrectly respond to the short-run need to boost growth or employment beyond a long-run equilibrium level. An underlying assumption is the ability of economic agents to differentiate between the central bank's monetary actions from other economic factors such as

inflation-induced supply shocks when forming expectations. In reality, IT is usually not rule-based and has often been denoted as 'constrained discretion' or 'framework' (King, 2005; Bernanke *et al.*, 1999). The inference is that these targets under a high-level degree of transparency and accountability by the central bank could still be missed. Under inflation targeting framework, therefore, the Central Bank must explain why targets are not met, of which most of the time is due to the unanticipated vagaries in the macroeconomic environment. While the monetary approach to manage inflation imposes higher real interest rates or slower credit growth to manage the money supply, the change in inertial inflation would not involve similar costs. Hence, there is a general agreement that formal inflation targeting enables the control of inflation at a lesser cost than monetary policy tools that focus on inflation reduction. In other words, inflation targeting tends to reduce the 'sacrifice ratio' which is the alternative foregone in terms of the output or employment, which must be sacrificed to lower inflation by a given amount.

3.2. Empirical Literature

There are plethora of studies on the conditions of IT regime. In the literature, the IT experience of advanced economies and emerging economies are often studied separately (Mishkin and Schmidt-Hebbel, 2006; and Ozdemir and Tuzunturk, 2009) ^[23]. There appears to be some consensus that the development level of a country often signifies their ability to have met necessary preconditions for adopting IT. Duman (2002) ^[14] asserts that "to implement inflation targeting effectively, an inflation-targeting central bank must have a forward-looking perspective and must construct conditional inflation forecasts to decide upon the current instrument setting".

Although Batini and Laxton (2007) ^[8] examined whether the pre-conditions are crucial for the successful adoption and implementation of IT. They found that none of the developing inflation targeters on their sample met pre-conditions which indicates that failure to meet them is not by itself an impediment to the adoption and success of inflation targeting. The authors concluded that even if meeting institutional and technical standards may not be critical before inflation targeting is adopted, a proactive approach to making improvements by the central bank and other parts of

government after adopting targeting may be essential to ensure the conditions needed for success.

Various studies have evaluated the success of IT countries in keeping inflation rates low. A study by Bamidele (2007) ^[12] discovered that countries that adopted IT regimes achieved a reduction in inflation and increased output. Similarly, Mishkin and Posen's (1997) ^[6] showed that IT countries maintained low inflation rates with improved economic growth in the long-run. Another study by Corbo, Landarretche, and Schmidt-Hebbel (2002) compared policies and outcomes in fully-fledged IT countries with two groups (potential to adopt IT and non-IT countries), they discovered that IT countries had reduced inflation forecast errors, and that inflation persistence declined strongly among IT adopters.

A look at the effectiveness of inflation targeting in developing countries can help in determining if Nigeria is ready for inflation targeting. Batini and Laxton's (2005) ^[7] study showed that developing countries that adopted inflation targeting had great improvements as inflation was lowered and growth increased, compared to when they were not inflation-targeting countries. A study by Lin and Ye (2007) ^[9] to show the outcome of inflation targeting on inflation and inflation variability in some developing countries found evidence that there was statistically significant evidence that inflation and inflation variability were lowered. Ghalwash (2010) ^[5] concluded that there is evidence that economic performance in developing countries gained more from adopting inflation targeting than the industrial ones, although he noted that IT has helped adopters achieve more stable and sometimes lower inflation, the evidence was not conclusive on a direct link between IT and improved economic performance.

In the available literature, Vega and Winkelried (2005) ^[17] suggest that implementing an IT regime leads to an "optimal" equilibrium when inflation is anchored around a target with moderately low inflation and low production volatility. Similarly, Bernanke and Woodford (2007) ^[10] citing King (2003) ^[7] posits that IT should be conceived as a way of implementing the optimal policy reaction function.

Even though an IT framework is expected to lead to lower levels of inflation, policymakers need to keep an eye on indicators that could project future inflation for the intermediate and long-term strategy as suggested by Seyfried and Bremmer (2003) ^[26]. Loayza and Soto (2002) ^[28] noted that while the term IT is now widely used by central banks and scholars, several characteristics of this monetary policy framework and its implications for economic performance are quite elusive. Furthermore, the fact that developing countries are highly heterogeneous and have had the chance to experiment with different monetary policy frameworks at different stages of their financial development may imply varied impacts of the inflation-targeting approach to monetary policy in various developing countries.

4. Methodology and Empirical Analysis

In this section, we try to examine the prerequisites and applicability of inflation targeting in Nigeria in a bid to understanding the feasibility of the adoption of IT in the country. The focus here is the assessment of the applicability of IT preconditions in Nigeria. To do this, we examined three core preconditions for IT adoption which are 1) independence status of the Central Bank of Nigeria (CBN); 2) the ability to forecast inflation accurately; and 3) the relationship between

inflation and monetary policy instruments.

4.1. Independence Status of the Central Bank of Nigeria (CBN)

Associated with the institutional preconditions for the adoption of IT, the Central Bank's independence and perhaps the most fundamental requirement needed for a central bank to pursue IT. However, a major challenge that arises here is the multiplicity in views and variation in the dimensional understanding of what central bank independence is. In dealing with this ambiguity, Ghalwash (2010) ^[10] identifies various dimensions from which a central bank's independence can be assessed. These dimensions include political and economic, constitutional, and statutory, independence within and independence from the government, strategic (to formulate policy) and tactical (day-to-day operations), instrument independence. Debelle and Fischer (1994) ^[3] highlighted that while a Central Bank may have independence on its use of monetary policy tools and instruments, it however, does not have goal independence. In this way, we sought to examine if Nigeria has met the basic preconditions for the adoption of an IT monetary policy framework.

To verify that this pivotal condition for IT is met, we examine two fundamentals associated with institutional conditions: 1) independence status of the CBN from the government; and 2) absence of fiscal dominance.

4.1.1. Central Bank Independence/Autonomy

The Central Bank of Nigeria (CBN) derives its mandate, backed by the 1958 Act of Parliament, which has been subsequently amended in 1991, 1993, 1997, 1998, 1999 and 2007.

The CBN Act 2007 charges the Bank with the overall control and administration of the monetary and financial sector policies of the Federal Government.

The mandates of the CBN are as follows:

1. Ensure monetary and price stability;
2. Issue legal tender currency in Nigeria;
3. Maintain external reserves to safeguard the international value of the legal tender currency;
4. Promote a sound financial system in Nigeria; and
5. Act as Banker and provide economic and financial advice to the Federal Government.

The current legal framework within which the CBN operates is the CBN Act of 2007 which repealed the CBN Act of 1991 and all its amendments. The Act provides that the CBN shall be a fully autonomous body in the discharge of its functions under the Act, and the Banks and Other Financial Institutions Act to promote stability and continuity in economic management. The law however fails to put primacy on the price stability function of the central bank which is also crucial for the adoption of IT regime (Green, 1996) ^[12].

A monetary policy decision in Nigeria is reached following a meeting of the Monetary Policy Committee (MPC). The legal backing for monetary policy by the Bank derives from the various statutes of the bank such as the CBN Act of 1958 as amended in CBN Decree No. 24 of 1991, CBN Decree Amendments 1993, No. 3 of 1997, No. 4 of 1997, No. 37 of 1998, No. 38 of 1998, 1999 and CBN Act of 2007. Section 12 Sub-sections (1) to (5), CBN Act of 2007 (Amended).

The MPC as backed by the laws of Nigeria i.e., CBN Act of 2007 (Amended) shall consist of -

- The Governor of the Bank who shall be the Chairman
- The four Deputy Governors of the Bank
- Two members of the Board of Directors of the Bank
- Three members appointed by the President; and
- Two members appointed by the Governor
 - The MPC shall have responsibility within the Bank for formulating monetary and credit policy;
 - The appointment of a member of the MPC under sub-section 2 (d) and (e) of this section, the remuneration, filling of temporary vacancies; and
 - Qualification, tenure of office, and disqualification shall be subject to the same terms as are stipulated for a Director under sections 10 and 11 of this Act.

The MPC determines how the various monetary policy tools at the disposal of the Central Bank are tweaked to achieve desired outcomes. To a large extent, the Central Bank of Nigeria is autonomous in its decision-making process. It is however important to note that in countries where the Committee is explicitly saddled with the responsibility of formulating monetary and credit policy, has government representatives and Presidential appointees as voting members on the Monetary Policy Committee the possibility of interference or at the least conflict of interest in decision making is likely.¹

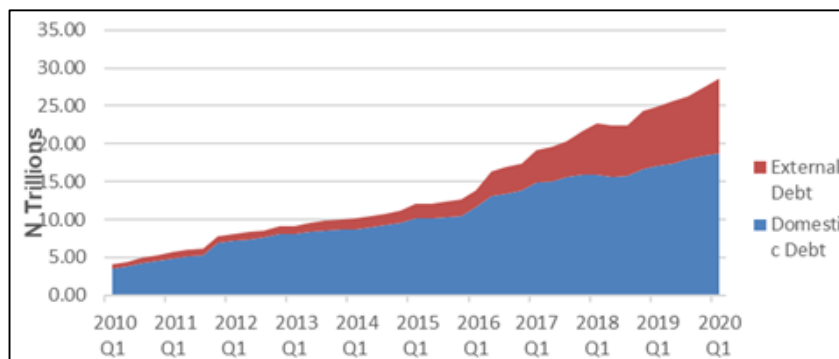
4.1.2 Absence of Fiscal Dominance

To effectively pursue IT, the Central Bank must not only have full legal autonomy, but it should also not be vulnerable to fiscal and political pressures with the potentials to trigger outcomes that conflict with the inflation targeting goal, such

as a huge fiscal deficit. A situation where there is a sustained huge fiscal deficit can weaken the central bank's autonomy for monetary management. No matter how fiscal deficits are financed, they often have inflationary implications. This is rather worsened when finance using ways and means due to pressure from the government leads to injection of new money which ultimately create the immediate distortionary effect in the economic system. An alternative channel through which fiscal deficit limits the ability of a Central Bank to target inflation is the interest rate channel.

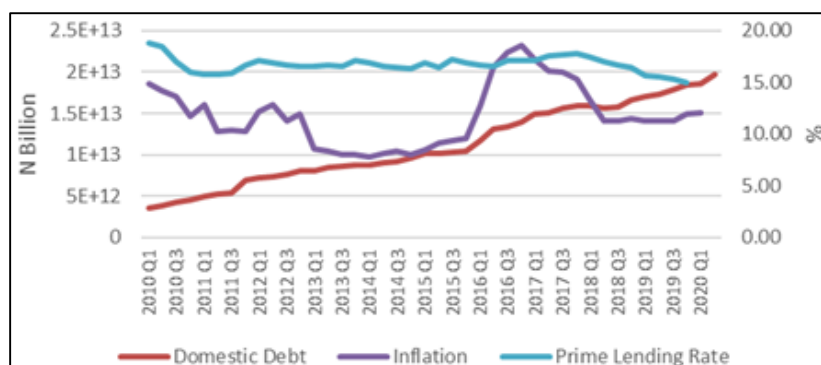
The suggestion here is that budget deficits cause a displacement of private investment and as such establishing a direct link between fiscal deficits and interest rates, with rising interest rates leading to the crowding-out of private investment expenditures. However, the empirical evidence for this argument is inconclusive. For example, on the one hand, Burney and Yasmeeen (1989) [21] linked deficits to higher interest rates in selected advanced economies. On the other hand, Evans (1987) [20] and Hoelscher (1983) [4] found that deficits do not have a significant impact on interest rates in some advanced countries.

Nonetheless, the fact that the interest rate mechanism is not as effective in its allocative function in a lot of developing and emerging economies due to poorly developed financial system, the mechanisms responsible for possible crowding-out is not as well-established. Moreover, it is possible to argue that due to large proportion of the public sector in total capital formation, the size of administrative controls over the financial system and the imperfect access to global capital markets by private debtors, the fiscal authority would still exert a rather strong pressure over private investment.



Source: Central Bank of Nigeria 2022

Fig 3: Trend of Total Public Debt in Nigeria (2010 Q1 – 2020 Q2)



Source: Central Bank of Nigeria 2022

Fig 4: Trend of Domestic Debt, Inflation and Prime Lending Rate in Nigeria (2010 Q1 – 2020 Q2)

¹ For further elucidation on central bank independence according to law (de jure), see Ghalwash (2010).

For want of a better proxy for fiscal dominance, we adopted the total public debt. A better proxy as suggested by the literature is the abuse or otherwise of ways and means. Moreover, due to the sensitivity of the ways and means data, it was inaccessible at the time of the study. Taking a closer look at the most recent data on fiscal deficit

in Nigeria suggests a more challenging situation. As of June 2020, Nigeria recorded a deficit of N2, 594.97 billion. The Federal Government borrowed N1,419.99 billion from the domestic markets through the issuance of FGN bonds to finance the budget deficit. This leaves a net overall deficit of N1,174.99 billion (see Table 2).

Table 2: Snapshot of Fiscal stance of Nigeria (January 2020 – June 2020)

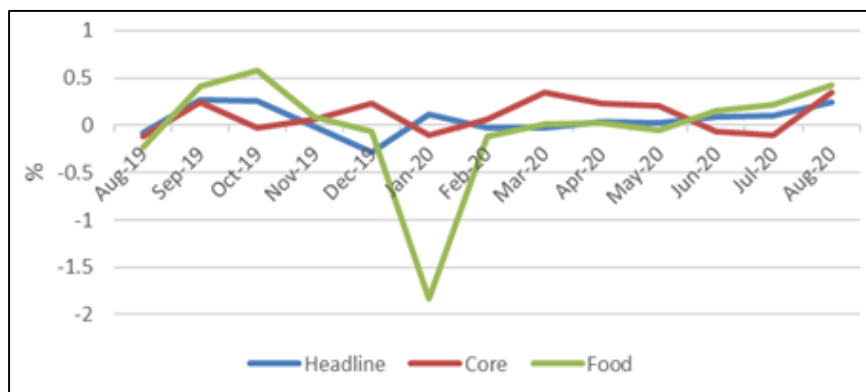
| Items | Jan-20 | Feb-20 | Mar-20 | Apr-20 | May-20 | Jun-20 | Total |
|----------------------------|---------|---------|---------|---------|---------|---------|-----------|
| Total FGN Retained Revenue | 297.52 | 431.02 | 303.31 | 236.04 | 358.57 | 235.55 | 1,862.00 |
| Total Expenditure | 780.80 | 863.77 | 725.66 | 747.42 | 736.36 | 602.96 | 4,456.97 |
| Deficit/Surplus | -483.29 | -432.75 | -422.35 | -511.38 | -377.79 | -367.41 | -2,594.97 |

It is important to note that a sustained reliance on domestic sources (FGN Bonds) for financing fiscal deficits could have negative consequences on the economy through largely crowding out of private sector investment and lead to an increase in domestic debt which often weakens the central bank monetary policy tools and ultimately limits the ability of central banks to target inflation.

4.2 Inflation Forecasting Accuracy

Inflation forecasts are pivotal for the adoption of IT framework due to its forward-looking tendencies that put central banks in a position that aims to control inflation over a specified target. Since central banks may sometimes not have perfect control over inflation as inflation can be affected by factors other than monetary policy and with lagged reactions to monetary policy, the accuracy of inflation

forecasts, therefore, provides for an ideal intermediate target. *“The central bank’s inflation forecast is indeed an ideal intermediate target: it is the current variable that is most correlated with the goal, it is more controllable than the goal, and it can be made more observable than the goal. It can also be made very transparent and may therefore facilitate the central bank’s communication with the public and the public’s understanding of monetary policy”* (Svensson, 1997)^[27]. This, therefore, suggests that the ability of the central bank’s internal inflation mechanism to effectively forecast inflation makes the credibility needed to pursue an IT regime available to the central bank. This credibility is needed for effective planning within the bank in formulating policies needed to achieve the targeted inflation but also, more importantly, the credibility is needed to repose public confidence in the central banks communication.



Source: Central Bank of Nigeria 2022

Fig 5: Variance in Actual and Forecast Inflation

As depicted in figure 3 above, the closer to zero variance between the actual and forecast inflation suggests the inflation forecasting accuracy of the Bank. The chart suggests significant distortions in actual and forecasts inflation, particularly for the food subcomponent of inflation, the inflation forecast significantly differed from the actual from December 2019 to February 2020. Similarly, core inflation was significantly under-forecasted from February 2020 through June 2020.

4.3. Existence of Relationship between the Monetary Policy Instruments and Inflation

One of the main preconditions for successful adoption of an inflation targeting framework based on the IT literature is the presence of a predictable interaction between inflation and monetary policy instruments (Truman, 2003)^[13]. Given this, we will examine the relationship between monetary policy

instruments and inflation rate using the consumer price index as a proxy. We adopt the empirical model used by Aliyu and Englama (2009)^[3], in line with the methodology employed by Gottschalk and Moore (2001) and Bakradze and Billmeier (2007)^[15].

$$X_t = A(L)X_{t-1} + B(L)Z_t + \epsilon_t \tag{i}$$

Where X_t is a vector of endogenous variables, Z_t is a vector of exogenous variables, A and B are matrices of reduced-form coefficients to be estimated, and ϵ_t is a vector of innovations, impulses, or shocks.

The endogenous variables in the model consist of the gross domestic product (yt), consumer price index (cpi), domestic money supply (dms), fiscal spending (fs), interest rate (ir), and exchange rate (er). The selected variables are based on existing literature such as Akuns et al (2016)^[2], Aliyu and

Englana (2009) ^[3], and Adebisi and Adeyemi (2008) ^[1]. Therefore, the empirical model to be estimated for the study is.

$$Z_t = (y_t, cpi, dms, fs, ir, er) \quad (ii)$$

The study adopts a Vector Autoregression (VAR) methodology and the Granger causality tests. The VAR methodology was adopted based on its forecasting ability when dealing with systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. As suggested by Ghalwash, (2010), to apply the Granger causality test in a VAR framework, the general mathematical representation of the test can be written as:

$$x_t = \alpha_t + \sum_{j=1}^m \beta_{1j} x_{t-j} + \sum_{j=1}^m \delta_{1j} z_{t-j} + \varepsilon_{1t} \quad (iii)$$

$$z_t = \alpha_2 + \sum_{j=1}^m \beta_{2j} z_{t-j} + \sum_{j=1}^m \delta_{2j} z_{t-j} + \varepsilon_{2t} \quad (iv)$$

Where α_t the constant terms, m is the lag order, and α_{it} are error terms and assumed to be serially uncorrelated with zero mean and finite covariance matrix. To test causality from z to x , the null hypothesis (H_{01}) is expressed as, $\alpha_{1j} = 0$ ($J = 1, 2, \dots, m$) and the alternative is at least one of $\alpha_{1j} = 0$ ($J = 1, 2, \dots, m$), is significantly different from zero.

Similarly, (H_{02}) of testing the causality from x to z is $\alpha_{2j} = 0$ ($J = 1, 2, \dots, m$), against at least one of α_{2j} is not zero.

This study used data for selected observations from the year 2000 Q1 to 2019 Q4. The choice of 2000 is premised on the notion that Nigeria returned to a civilian regime of governance in the second quarter of 1999 and has had an uninterrupted continued civilian rule since then. It is expected that since inflation targeting requires central bank independence, which is theoretically absent under a military regime, we leave out the remaining two quarters of 1999 for fear of military overhang and room for adequate adjustments to the civilian regime.

One of the main preconditions to be satisfied before inflation targeting can be adopted is the presence of a stable and predictable relationship between monetary policy instruments and inflation. A general expectation is that there will be a strong positive and causal relationship between monetary policy variables as well as GDP on inflation. Given this, this study, therefore, compares the relationship between inflation and various monetary policy variables.

4.3.1 Descriptive Statistics

This section gives a summary statistic of the entire data used as retrieved from the source, using mean, median, maximum, minimum, and standard deviation.

Table 3: Descriptive Statistics

| | GDP (N'Bn) | INF (%) | M2 (N'Bn) | FISPND (%) | PLR (%) | EXR (N/US\$) |
|--------------|------------|-----------|-----------|------------|----------|--------------|
| Mean | 10917.71 | 12.14188 | 11311.239 | 0.088236 | 18.12200 | 170.8433 |
| Median | 12209.96 | 11.86500 | 10813.063 | 0.082875 | 17.11500 | 150.7550 |
| Maximum | 19527.72 | 24.32000 | 29137.800 | 0.139182 | 26.26000 | 306.9500 |
| Minimum | 1701.050 | -1.430000 | 795.52900 | 0.063109 | 14.88000 | 99.87000 |
| Std. Dev. | 5924.082 | 4.465517 | 8735.2150 | 0.018498 | 2.592657 | 66.68841 |
| Observations | 80 | 80 | 80 | 80 | 80 | 80 |

Source: Author's Computation 2022; Data: CBN statistical bulletin. (GDP=Gross Domestic Product, INF=Inflation, M2=Money Supply, PLR=Prime Lending Rate, EXR=Exchange Rate, FISPND=Fiscal Spending)

The result of the interpretation for table 4.2 above shows that the Gross Domestic Product (GDP), Inflation (INF), Money Supply (M2), Fiscal Spending (FISPND), Prime Lending Rate (PLR), and Exchange Rate (EXR) has an average value (mean) of N10,917.71bn, 12.14%, N11,311.24bn, 0.088%, 18.12%, and 170.8433 N/\$, respectively. While the Minimum values which indicate the smallest values of the variables, GDP, INF, M2, FISPND, PLR, and EXR are N1,701.05bn, -1.43%, N795.53Bn, 0.063%, 14.88%, and 99.87N/\$, respectively. The highest values for the variables which are the maximum values are, GDP which is N19,527.72 bn, INF with a value of 24.32%, M2 at N29,137.80 bn, FISPND stood at 0.139%, PLR with a value of 26.26%, and EXR which is 306.95N/\$. While the median values for each variables GDP, M2, FISPND, PLR and EXR are N12,209.96bn, 11.86%, 9.30%, N10,813.06bn, 0.083%, 17.12% and 150.78N/\$, respectively.

4.3.2 Empirical Analysis

This section presents the result of the empirical analysis. It is

divided into three categories: pre-estimation test, estimation, and post-estimation test. A pre-estimation test of unit root test was carried out for each of the variables to test for stationarity and determine the right estimation technique to use. After which the granger causality test was done and also impulse response and variation decomposition. Post-estimation tests like heteroskedasticity and stability were also conducted.

4.3.2.1 Pre-estimation Test

Table 4.3 below presents the unit root test carried out for the variables used in this study. The unit root is carried out using the Augmented Dickey-Fuller (ADF) test at level and 1st difference, which revealed the order of integration at 1st difference (I (1)) for all the variables examined. Since all the variables are significant at the 1st difference level, Vector Auto-Regression (VAR) analysis is employed. The results, therefore, depict that all the variables are integrated of order 1.

Table 4: Unit Root Test

| Variable | ADF | | | | Order of Int. |
|----------|-----------|-------------------|----------------|-------------------|---------------|
| | Level | | 1st Difference | | |
| | Intercept | Trend & Intercept | Intercept | Trend & Intercept | |
| GDP | -1.776467 | -1.086300 | -13.58429*** | -14.25770*** | I(1) |
| INF | -2.481997 | -2.505696 | -3.212655** | -7.339800*** | I(1) |
| M2 | 1.859865 | -1.836642 | -9.837023*** | -8.040696*** | I(1) |
| PLR | -1.617667 | -2.359629 | -6.983389*** | -6.935857*** | I(1) |
| EXR | 0.266419 | -1.281003 | -7.711696*** | -7.772226*** | I(1) |
| FISPND | -0.676596 | -0.097259 | -4.495811*** | -5.857323*** | I(1) |

Source: Author’s Computation 2022; Data: CBN statistical bulletin. (GDP=Gross Domestic Product, INF=Inflation, M2=Money Supply, PLR=Prime Lending Rate, EXR=Exchange Rate, FISPND=Fiscal Spending)

Lag Length Criteria of Actual Inflation

Table 4.4 below presents the lag length criteria result on the series used in the study. The table reveals the result of the lag length criteria for the first model with the actual inflation. The criteria of the VAR starts with the specification of the maximum lag of 5. An asterisk signifies the selected lag from

each column of the criterion statistic. Based on the *sequentially modified LR test statistic (each test at 5% level) (LR)*, Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC), and Hannan-Quinn information criterion (HQ) the study considered the lag length of 5 as the optimal lag length.

Table 5: Lag Length Criteria of Inflation Actual

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|-----------|-----------|-----------|------------|------------|------------|
| 0 | -73.49821 | NA | 3.36e-07 | 2.119952 | 2.305351 | 2.193980 |
| 1 | 467.3600 | 980.7562 | 4.79e-13 | -11.34293 | -10.04514* | -10.82474* |
| 2 | 497.4694 | 49.78102 | 5.71e-13 | -11.18585 | -8.775664 | -10.22349 |
| 3 | 540.2386 | 63.86865 | 4.99e-13 | -11.36636 | -7.843782 | -9.959835 |
| 4 | 591.1194 | 67.84101 | 3.68e-13 | -11.76318 | -7.128207 | -9.912489 |
| 5 | 666.8450 | 88.85141* | 1.49e-13* | -12.82253* | -7.075163 | -10.52767 |

Note: * indicates lag order selected by the criterion; LR: sequentially modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion
 Source: Author’s Computation; Data: CBN statistical bulletin; Variables considered: (GDP=Gross Domestic Product, INF=Inflation, M2=Money Supply, PLR=Prime Lending Rate, EXR=Exchange Rate, FISPND=Fiscal Spending)

Granger Causality Test

The study further conducted Granger causality tests, for the five (5) lags established by lag length selection criteria in one of the preceding tests. The study used the VAR Granger causality to study the relationship between monetary policy variables and inflation in Nigeria. The result in table 4.5 showed that there is no joint significance among the monetary policy variable and inflation since it accepts the null hypothesis. However, only fiscal spending shows it can cause significant variation in inflation and as such, suggesting that inflation may not be a wholly monetary phenomenon for Nigeria.

Table 6: Granger Causality of Inflation

| Dependent variable: INF | | | |
|-------------------------|----------|----|--------|
| Excluded | Chi-sq | Df | Prob. |
| GDP | 8.327757 | 5 | 0.1391 |
| FS | 13.36125 | 5 | 0.0202 |
| M2 | 1.994697 | 5 | 0.8499 |
| PLR | 3.126367 | 5 | 0.6805 |
| EXR | 5.294560 | 5 | 0.3810 |
| All | 34.00227 | 25 | 0.1079 |

Source: Author’s Computation 2022; Data: CBN statistical bulletin; Variables considered: (GDP=Gross Domestic Product, INF=Inflation, M2=Money Supply, PLR=Prime Lending Rate, EXR=Exchange Rate, FISPND=Fiscal Spending)

4.3.2.2 Estimation Test

Impulse Response of Inflation

The impulse response function graph that is presented in Figure 4.4 is used to show the relationship between the monetary policy instruments and inflation. An impulse response traces the effect of a shock to an endogenous variable. We used 12 quarters ahead in the analysis of impulse response function and the variance decompositions and 95 percent confidence interval, which is represented by the dotted lines.

The quarterly impulse response functions indicate how the monetary policy and other related variables affect inflation. It shows how inflation responds to impulses as related to the other endogenous variables. The response of inflation to its impulses shows its being negative from quarter 4 to 7 which became positive afterward but ended in negative from quarter 10.

The response of inflation to GDP impulses shows a consistently negative response, except from quarter 6 to 9 where there seems to be stability. In the case of the money supply impulses, inflation maintained a positive response, while initial inflation response to prime lending rate impulses was a decline before it became positive from quarter 5. Fiscal spending impulses initially led to positive responses in inflation, however succumbed in quarter 5 to consistent decline. As for exchange rate impulses, there was an initial positive response through to quarter 7 when it became negative through quarter 10, then became positive again.

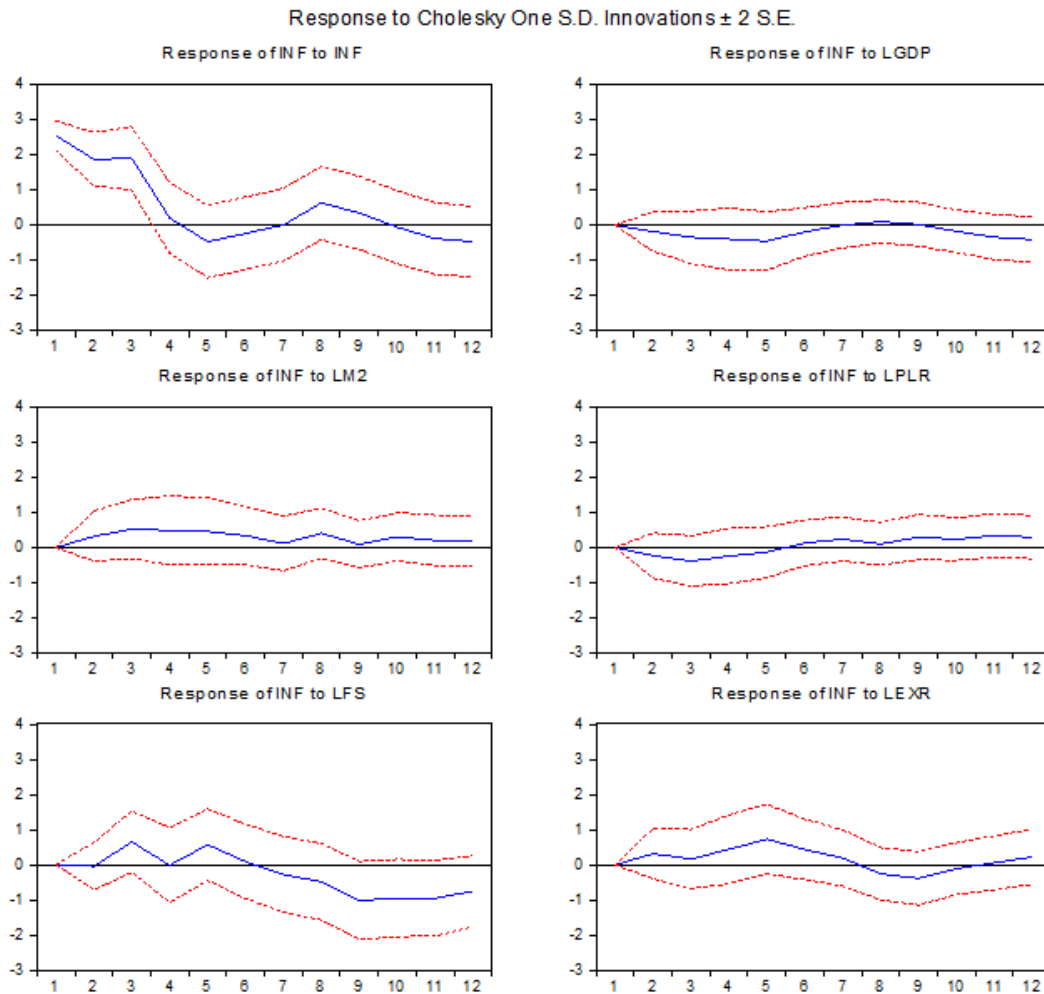


Fig 6: Impulse Response on Inflation

Variance Decomposition of Inflation

The result of variance decomposition presented in table 4.6 below shows the contribution of each shock to the variance in actual inflation. In other words, it shows how much of a change in actual inflation is due to own shock, and how much is due to shocks to other variables. The variance decomposition is estimated within 12 quarters.

The table shows that 100% and 63.00% variation in actual inflation is due to its shock in periods 1 and 12 respectively. The effect of Gross Domestic Product on actual inflation increases from 0.33% to 3.71% through quarter 2 to 12, while about 0.03% and 19.83% of innovation in actual inflation in

the 1st and 12th period can be attributed to the shock due to fiscal spending. The percentage of innovation in actual inflation that is explained by the shock due to money supply shock in the 2nd period is 0.96%, while it explains about 6.47% in the 12th period. Similarly, only 1.22% and 5.76% of innovations in actual inflation can be attributed to shock due to prime lending rate and exchange rate in quarter 12. These imply that apart from actual inflation shock on itself, fiscal spending shock has the highest percent of innovations in actual inflation, and this is followed by money supply (M2) in the system.

Table 7: Variance Decomposition of Inflation

| Period | S.E. | INF | LGDP | LFS | LM2 | LPLR | LEXR |
|--------|----------|----------|----------|----------|----------|----------|----------|
| 1 | 2.551330 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 3.213911 | 97.18733 | 0.328334 | 0.030756 | 0.958914 | 0.546395 | 0.948274 |
| 3 | 3.865650 | 91.41722 | 1.024535 | 4.268274 | 1.654041 | 0.798004 | 0.837929 |
| 4 | 3.953418 | 87.67145 | 1.982692 | 4.179600 | 2.999057 | 1.137709 | 2.029494 |
| 5 | 4.140789 | 81.21244 | 3.004619 | 6.341850 | 3.426154 | 1.039475 | 4.975459 |
| 6 | 4.190556 | 79.60581 | 3.137806 | 6.278595 | 3.933614 | 1.136327 | 5.907845 |
| 7 | 4.212510 | 78.77897 | 3.105184 | 6.693501 | 4.061821 | 1.308753 | 6.051768 |
| 8 | 4.316622 | 77.18354 | 3.014824 | 7.287167 | 5.142525 | 1.246519 | 6.125430 |
| 9 | 4.476817 | 72.35570 | 2.805592 | 11.99688 | 5.183016 | 1.207171 | 6.451645 |
| 10 | 4.597351 | 68.62805 | 2.809064 | 15.25002 | 5.980382 | 1.156151 | 6.176334 |
| 11 | 4.741060 | 65.18311 | 3.156373 | 18.34861 | 6.298030 | 1.193361 | 5.820515 |
| 12 | 4.858606 | 63.00726 | 3.714654 | 19.82930 | 6.469032 | 1.224390 | 5.755359 |

Source: CBN statistical bulletin 2022 (LGDP: Gross Domestic product, LFS: Fiscal Spending, LM2: Money Supply, LPLR: Prime Lending Rate, Exchange Rate)

4.3.2.3 Post Estimation Test

Model Stability Test: AR Roots Graph

Figure 4.5 below presents the test on stability condition for the VAR model. This is to check if the impulse response standard errors are valid. From the figure, almost all the dots lie inside the inverse roots circle. This confirms the stability of the estimated Model.

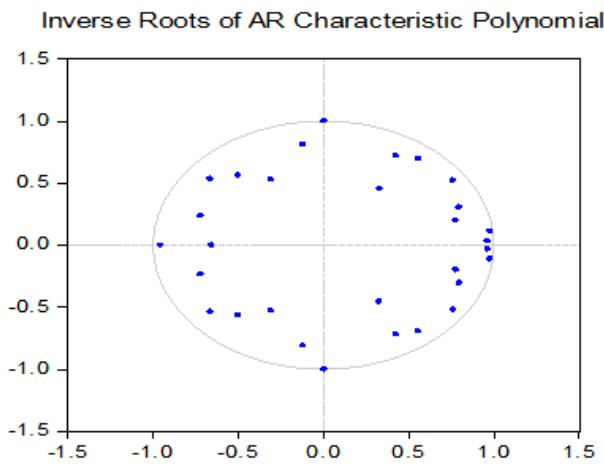


Fig 7: AR Roots Graph: Stability Test for Inflation Model

Heteroskedasticity Test: White Test

The white heteroskedasticity test performed on the model in the table below was to ascertain the presence or otherwise of heteroskedasticity. The null hypothesis of the white test states that there is no heteroskedasticity. If the probability value is significant, then the null hypothesis is rejected, if stated otherwise, then the null hypothesis is accepted. However, the White heteroskedasticity null hypothesis was accepted with the probability value of 0.2702, which means there is no heteroskedasticity.

Table 8: White Heteroskedasticity Test for Inflation Actual Model

| Joint test: | | |
|-------------|------|--------|
| Chi-sq | Df | Prob. |
| 1290.305 | 1260 | 0.2702 |

5. Conclusion

This study sought to evaluate the feasibility of the adoption of inflation-targeting approach to monetary policy as a policy approach option for Nigeria. In this bid, the paper relied on the literature on selected necessary conditions needed to be considered for a successful implementation of IT. The study evaluated some of the necessary preconditions for IT particularly the autonomy in decision-making, the absence of fiscal dominance, as well as empirically testing the precondition that necessitates the need for a predictable relationship between inflation and monetary policy variables. To empirically test the relationships, we utilized the Vector Autoregressive (VAR) estimation technique, and a Granger causality test to examine the nature of relationship between the variables.

In investigating the degree of autonomy of the Central Bank of Nigeria in its decision-making process, the study found that members are approved by the legislature, and the existence of government representatives and presidential appointees as voting members on the Monetary Policy Committee reflects the possibility of interference. On the possibility of fiscal dominance, we found that rising fiscal

deficit trend in the country portends the capacity to hinder the effectiveness of monetary policy tools.

The estimation results suggest that apart from actual inflation shock on itself, fiscal spending shock has the highest percent of innovations in actual inflation, and this is followed by money supply (M2) in the system. Also, the causality test disclosed that apart from fiscal spending which shows it can cause significant variations in inflation, there is no joint significance among the monetary policy variables and inflation, thereby suggesting the possible limitations for monetary policy tools in attaining the price stability objective of the Central Bank of Nigeria.

Given the foregoing, there is insufficient evidence to show that an outright inflation targeting regime will be effective as a monetary policy framework approach, or that Nigeria is ready to fully adopt this approach for its monetary policy. The country, however, may seek to pursue a Lite IT regime not because it already has satisfied all necessary preconditions, but because it can use the adoption of Lite IT to prepare towards satisfying the preconditions for implement full IT due to the enormous advantages of IT.

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