INFLATION TARGETING AND ECONOMIC GROWTH IN NIGERIA: A VECTOR AUTO REGRESSIVE (VAR) APPROACH

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Abstract

Various evaluations have attested to the success of inflation targeting (IT) as a potent framework for monetary policy in both developing and developed economies for sustainable economic growth. This study examines the achievement of sustainable economic growth through inflation targeting using the Vector Autoregressive (VAR) Model Approach. The study employs annually time series data spanning from 1981-2010. The variables of interest are consumer price index (CPI), Gross Domestic Product (GDP), Exchange Rate (EXR), US consumer price index (USCPI) as a proxy for foreign price, Money supply (M2) and Interest Rate (INTR). The empirical results show that in the VAR model, exchange rate contributes significantly to inflationary pressure in Nigeria, which is a reflection of the import-dependent nature of the economy. Hence, the need to develop the real sector of the economy through incentives that will induce investment becomes necessary.

Key Words: Inflation Targeting, Economic Growth, Monetary Policy, Vector Auto-regression
Jel Classification: E23, C30, E52

Introduction

Inflation targeting (IT) is the new orthodox theory of mainstream macroeconomic thought. Various evaluations have attested to the success of inflation targeting as a potent framework for monetary policy in both developing and developed economies (Bernanke, Laubach, Mishkin and

Posen, 1999). It is popular because of its ability to set clear standards to evaluate whether or not central banks achieve their inflationary goals, keeps them accountable and guarantees their independence (Petursson, 2005; Kiruhara, 2005). Under inflation targeting, central banks commit to a target level of inflation, usually over one-year horizon.(CBN, 2010). The approach has now been adopted by twenty four central banks, and many more, including those in developing countries, are expressing serious interest in following suit. Initially adopted by New Zealand in 1990, the norms surrounding the IT regime have been so powerful that some Central Banks of both the industrialized and the developing economies alike have declared that maintaining price stability at the lowest possible rate of inflation is their only mandate. It was and to some extent it still is, generally believed that price stability is a pre-condition for sustained economic growth and employment, and that "high" inflation is damaging the economy in the long run.

For its proponents, the appropriate inflation target is typically prescribed as maintaining price stability, though there is less agreement on the meaning of this term and on its precise measurement. Many practitioners simply adopt the widely-cited definition of Alan Greenspan, the former Governor of the U.S. Federal Reserve, as "a rate of inflation that is sufficiently low that households and businesses do not have to take it into account in making every day decisions". For Feldstein (1997), however, price stability meant a long-run inflation rate of zero. On the same line, Bernanke, Laubach, Mishkin and Posen, (1999) defines inflation targeting as a framework for monetary policy characterized by the public announcement of official quantitative targets (or target ranges) for the inflation rate over one or more time horizons, and by explicit acknowledgement that low, stable inflation is monetary policy's primary long-run goal. Among other important features of inflation targeting are vigorous efforts to communicate with the public about the plans and objectives of the monetary authorities, and, in many cases, mechanisms accountability for those objectives." From this definition, the authors take some care to describe inflation targeting as a framework and not as a rule. In other words, inflation targeting fits somewhere between the extremes which feature in the "rules versus discretion" debate which raged in monetary policy circles in earlier years. Inflation targeting is not "automatic" in the sense of a Friedman-like rule by which growth in the money supply is governed in order to achieve the ultimate goal of price stability (Sherwin, 2000). But nor does inflation targeting allow the central bank full discretion to take decisions in any ad hoc or unconstrained fashion. Rather, inflation targeting can be described as a form of "constrained discretion" (Sherwin, 2000). To quote Bernanke, Laubach, Mishkin and Posen, (1999), "By imposing a conceptual structure

and its inherent discipline on the central bank, but without eliminating all flexibility, inflation targeting combines some of the advantages traditionally ascribed to rules with those ascribed to discretion."

In addition, inflation targeting is usually associated with appropriate changes in the central bank law that enhances the independence of the institution (Bernanke, Laubach, Mishkin and Posen, 1999; Mishkin and Schmidt-Hebbel, 2001; Buiter, 2006) for an evaluation. The implementation of inflation targeting then depends, among other things, on the following conditions: (1) the assignment of the target; (2) the interaction of the target with other policy goals; (3) the appropriate definition of the target; (4) the role of inflation forecasts; and (5) the degree of the accountability of the central bank to achieve the target **(**Tutar, 2002). On the assignment of inflation targeting framework, the success of the framework depends on the central bank's instrumental independence and the announcement of the inflation target, which differ across countries. Debelle (1997) observes that to promote the agreement between the central bank and the government and to increase the effectiveness and the credibility of inflation targeting framework in any country, central bank should be responsible for announcing inflation target while government should only endorse it.

Economic theorists share varying views about inflation targeting as a tool for economic development, however one of the consensus views among economists is the importance of a low and stable inflation. Economic theory posits that low and stable inflation is important for market-driven sustainable economic growth, and that monetary policy is the most direct tool for controlling inflation. Furthermore, among the entire government tools for influencing and directing the economy, monetary policy has proven to be the most flexible instrument for achieving medium-term stabilization objectives.

In Nigeria, for some time now, Inflation targeting has been accepted as the principle to guide monetary policy by the government and the CBN. However, the CBN's commitment to the effective implementation of this framework remains to be seen. For instance, the CBN has not specified if targeting refers to core inflation or overall inflation or if the target is a specific level or a range. The central bank also lacked the operational autonomy that is required for effective inflation targeting. Encouragingly, with the enactment of the 2007 Central Bank of Nigeria (CBN) Act, operational autonomy of the CBN was strengthened. The Bank was charged with the responsibility of achieving price stability among other functions and the appointment and removal of the CBN Governor is subject to the confirmation of the Senate as enshrined in the Act. Uchendu (2007) further noted that the launching of the Financial System Strategy (FSS) 2020, added

vigor towards implementation of inflation targeting (IT) framework in the country since it hinges on strategic objective of achieving low single digit inflation. The Bank on its part decomposed its Research and Statistics Department into a department each with a view to strengthen and improve the quality of data and research output carried out in different aspects of monetary policy implementation. Recently, modeling units in the Research department has been charged with the task of developing a robust model for Nigeria. The rest of the paper is organized as follows: Following the introduction is a survey of the literature review which consists of conceptual framework, theoretical review and empirical review. Section three focuses on sustainable economic growth through inflation targeting while section four is the methodology of the research covering issues relating to the sources of data, model specification and techniques of analysis. In section five, the empirical analysis are undertaken and results are discussed. While summary, recommendations and concluding remarks are contained in section six.

Literature review

As is well known, inflation targeting was introduced in New Zealand in 1990. As Murray (2006) points out, when inflation targeting was implemented in New Zealand, it was viewed as a special case, because New Zealand was a small open economy that had just announced a number of audacious reforms. Those reforms were helpful in restraining inflation particularly in the country's significant fiscal consolidation, labour market reforms, and major reductions in barriers to international trade. The Policy Targets Agreement was a creative and reasonable extension of this first wave of reforms. It was designed to lend more discipline and accountability to the conduct of monetary policy.

Conceptual and Theoretical Framework

Inflation Targeting:

At present there is no single most accepted definition of inflation targeting, some kind of generic characterizations of what constitutes inflation targeting are common in the literature. For example, Truman (2003) noted that some writers including Bernanke and Mishkin 1997; Bernanke, Laubach, Mishkin and Posen, 1999; King, 2002; Kuttner and Posen, 2000) refer to inflation targeting as offering a framework of "constrained discretion" in which the constraint is the inflation target which may be a point or a range, and the discretion is the scope and flexibility to take account of economic and other considerations.

Attempt is also made in the literature to distinguish between strict inflation targeting (SIT) and flexible inflation targeting (FIT). SIT is the type

characterized by Uchendu (2009) as that form of IT which disregards entirely the real effects of monetary policy in the short-and medium-term, and focuses exclusively on controlling inflation within the shortest possible time horizon. This kind of inflation targeting is practiced by any central bank as at the present, rather what inflation targeting central bank practice is the FIT which in general terms is that the primary goal of monetary policy is to achieve price stability in the form of an inflation target, while also paying attention to stabilizing the business cycle (Uchendu, 2009).

Essentially, IT may be viewed as a strategy in which the central bank adopts a numerical target for inflation and commits to achieving the target a (Pierre, 1999). Mordi (2008) noted that this means that as long as inflation remains within the stated range, the central bank is free (and indeed expected) to stabilize the economy. However, if at some point inflation threatens to exceed the permissible range, then the central bank must make the inflation target its overriding objective and work towards containing it to within that range. Many authors including (Mishkin 2000; and Truman, 2003) have identified the essential elements of IT to include:

- Institutional commitment to price stability as the primary goal (explicitly or implicit) of monetary policy;
- Numerical target or sequence of targets aimed at making the goal operational;
- Time horizon to reach the inflation target or to return (if missed) to the inflation target;
- Evaluation on-going review of whether target will be or has been met;
- An information inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate, are used to decide the setting of policy instrument and;
- Increased transparency of the monetary policy strategy through communication with the public and the markets about the plans, objectives, and decisions of the monetary authorities.

``According to Tsenkwo (2010), the hallmark of inflation targeting is the announcement by the government, the central bank, or some combination of the two that in the future the central bank will strive to hold inflation at or near some numerically specified level. Inflation targets are more often than not specified as for example 1-3 percent, rather than single number and are typically established for multiple horizons ranging from one to four years. However, Tutar (2002), reported that the centre point of inflation target is referred to as their interpretation of the operational definition of price stability. While in theory, inflation appears to be equal to price stability, in

practice, the concept of price stability is influenced by some issues like price level measurement and nominal rigidity. However, what appeared to be more comprehensive regarding the concept of inflation targeting was the one providing by Eichgreen (2001) where he defined inflation targeting as follows:

"a monetary policy operating strategy with four elements; an institutionalized commitment to price stability as the primary goal of monetary mechanism rendering the central bank accountable for attaining its monetary policy goals; the public announcement of target inflation; and policy of communicating to the public and the markets the rationale for the decision taken by central bank". To state clearly, an inflation targeting arrangement is not just about public pronouncement of an inflation target/range. Important features of an inflation target arrangement include the definition of what type of inflation is being targeted, the inflation target range, the use of exclusion clauses or caveat for example under what circumstances the central bank is able to overshoot its target), and the target horizon. However, Bulir (2008) used three key inflation targeting communication tools-inflation targets, inflation forecasts, and verbal assessments of inflation factors contained in quarterly inflation reports-provided consistent message in five out of six countries: Chile, the Czech Republic, Hungary, Poland, Thailand and Sweden. However, no single central bank, according to him in the sample stands out as an exceptional good forecaster of inflation and communication of its policies.

Conceptually, inflation targeting (IT) decreases monetary policy framework in which central banks accept and announce certain targets of inflation, over a given period of time, as measure of policy anchor and are accountable for deviation of actual from set of targets. Three main forms of inflation targeting have been identified: (i) Full fledge IT (FFIT), that is, when a country is ready to adopt IT as its single nominal anchor upon which macroeconomic stability would be achieved. This s suitable with countries with robust or sound financial environment, and a central bank, which is transparent, accountable and high committed to the attainment of the goal of IT. (ii) Electric IT (EIT), when a country, for instance pursues IT along with other monetary policy objectives in a stable financial environment which, however, is less accountable and transparent. (iii) Inflation targeting lite (ITL), low profile forms of inflation targeting pursues by countries, largely due to lack of strong or credible macroeconomic environment. ITL float their exchange rate and announce an inflation target, but are not able to maintain the inflation target as the foremost policy objective. A number of emerging markets are practitioners of ITL. It is agreed also that FFIT is not possible in ITL countries because of the following: (a) Lack of sufficiently fiscal position and high debt/GDP ratio. (b) Lack of a fully developed monetary

and financial system. (c) Vulnerability of economic shocks (especially supply shocks) owing to their low degree of development. (d) Lack of transparency in the operation and implementation of monetary policy (Englama and Aliyu, 2009).

In practice, all types of monetary policy involve modifying the amount of monetary base (Mo) in circulation. This process of changing the liquidity of base currency through the open sales and purchases of (government-issued) debt and credit instruments is called open market operations. Constant market transactions by the monetary authority modify the supply of currency and this impacts other variables such as short-term interest rates and exchange rate. The distinction between the various types of monetary policy lies primarily with the set of instruments and variables that are used by the monetary authority to achieve their goals (Tsenkwo, 2010).

The New Open Economy Macroeconomics Paradigm

While the central bank can in principle embrace any model for its purpose, in practice inflation targeting regimes (and also the theoretical literature on inflation targeting have adopted the version of what is known as the "New open economy macroeconomics paradigm" (Chang, 2007). In this paradigm, exchange rate news affects forecasts of future inflation through a few specific channels including:

i. Exchange rate shocks affect the prices of some imported goods that are included in the consumer price index.
ii. Exchange rate also affects the cost of imported intermediate inputs to domestic production, which in turn may affect aggregate supply relations between inflation and output gap.
iii. Real exchange rate movement which may be due to nominal ones can affect the relative demand for domestically produced goods vis- a- vis foreign goods, therefore affecting the aggregate demand.
iv. Finally, exchange rate shocks may affect domestic interest parity conditions, and hence investment demand.
v. Hence, one should expect IT central bankers to justify any policy reaction to exchange rate developments (Tsenkwo, 2010).

Empirical Literature

Many developed and emerging economies switched to inflation targeting as their monetary policy regime. Different inflation forecasting models have been developed to forecast inflation especially in developed countries. Adopting the standard general-to-simple approach, Sekine (2001) attempted a structural model-based forecast for Japan with a view to deriving a structural inflation function as an equilibrium correction model. With the primary objective of establishing a long run relationship in the Japanese inflation process, the paper found excess money and output gap as the major

determinant of inflation process in its construction of a one-year-ahead inflation forecast for the economy. Barden, Jansen and Mymoen (2003) constructed an inflation targeting econometric model for Norway at the time the country was transiting from exchange rate targeting to inflation targeting. Their focus was to empirically quantify the importance of the different transmission mechanisms rather than calibrating the values as well as harness the design and estimation of econometric models in the forecasting of inflation to enhance policy analysis. Using a smaller simultaneous model of wage and price setting (core model) along with marginal models of the rest of the economy, they found that inflation can be affected by changing the short term interest rate and that the main channels of transmission are through the output gap and unemployment level, while interest rate can be used to offset shocks to GDP output. In developing and new emerging economy, Lopez (2003) investigated the efficient policy rule for inflation targeting in the Columbian economy. The paper examined the place of well-defined policy rule in inflation targeting using inflation-output variability frontiers in the manner of Taylor's rule (1979). The purpose is to determine the reaction function that would be efficient in the minimization of output gap, inflation and instrument variability. Using stochastic simulations of the macroeconomic model of the Columbian economy, the results showed that output variability in the Taylor's rule was lower than the inflation forecast-based rules while inflation and instrument variability were very high (CBN, 2010). In the study conducted by Ye and Lin (2008) on the effect of inflation targeting in thirteen (13) developing countries, using variety of propensity score matching methods, their results showed that on the average, inflation targeting has large and significant effects of lowering both inflation and inflation variability in these thirteen countries.

Table 1: Key indicators of developing countries that follow inflation targeting.

Country	**Year of IT**	**GDP**		**Inflation rate**	
		Before	**After**	**Before**	**After**
Thailand	2000	0.6	5.1	4.3	2.7
Korea	1998	4.5	5.7	5.5	2.8
Philippines	2002	3.0	5.4	6.0	5.8
Indonesia	2005	4.7	5.5	9.3	13.1
Pakistan	-	7.0	-	6.3	-

Source: SBP Research Bulletin Vol. 5 No.3, 2009

Table 1.0 above shows that all the counties experienced an expansion in GDP and a reduction in inflation rate respectively after an inflation targeting policy.

INFLATION TARGETING AND SUSTAINABLE ECONOMIC GROWTH IN NIGERIA

For the Central Bank of Nigeria (CBN), the primary objective in its conduct of monetary policy is to maintain a stable price level that supports sustainable economic growth and employment. While other central banks adopted numerical inflation or nominal GDP targets as guides for monetary policy since the 1980s and 1990s because financial market innovations and deregulations rendered monetary aggregates less reliable policy guides, the CBN did not deviate from the conventional monetary aggregate as the appropriate intermediate target. An implicit assumption with respect to this choice is that the intermediate target chosen is measurable, controllable, and predictable. In addition, it is assumed that the money demand function is stable in the conduct and implementation of monetary policy. This is very important because the money demand function is used both as a means of identifying medium term growth targets for money supply and as a way of manipulating the interest rate and reserve money for the purpose of controlling the total liquidity in the economy and for controlling inflation rate (Owoye and Onafowora, 2007).

A common argument for conducting monetary policy so as to keep inflation very low (e.g., in the lower single digits) is that inflation is harmful to long-run growth. There are several reasons for this: inflation can raise transactions costs and may contribute to uncertainty about the future. However, there is no consensus in the literature that maintaining rates of inflation at a typical inflation targeting level (e.g., around 5 percent) necessarily leads to faster growth.

One early study of the relationship between inflation and growth across 127 countries found that growth rates declined only when inflation rates moved beyond 20-25 percent and that growth increased as inflation rose up to the 15-20 percent range (Bruno, 1995). Similarly, Bruno and Easterly (1995) reported that the negative relationship clearly manifests itself only when inflation exceeds 40 percent. These early estimates were based on combined data across all countries. However, the threshold at which inflation reduces growth appears to vary between developed and developing countries. Khan and Senhadji (2001) identify the threshold point at which inflation reduces economic growth at 1 to 3 percent for developed economies, but the threshold point for developing countries is between 11 and 12 percent. Pollin and Zhu (2006) find that higher inflation is associated with moderate gains in GDP growth up to 15-18 percent inflation, after which growth begins to decline. The results are more robust in developing countries relative to developed economies. Some researchers have found that the threshold at which inflation reduces growth is in the single-digits (Ghosh & Phillips, 1998). What can we conclude from these studies? There is broad consensus that rapid rates of inflation will have a negative impact on growth, and this turning point will most likely be reached once inflation exceeds 15 to 20

percent. Only a few studies show that reducing inflation down to the level typically adopted in inflation targeting regimes will contribute to stronger growth. Other studies suggest that keeping inflation in this range actually leads to slower growth. At best, the benefits of maintaining inflation in the lower single digits are uncertain and there is a possibility it may slow the process of development.

Methodology

Sources of Data

The study employs Vector Autoregressive (VAR) Model Approach using annually time series data spanning from 1980-2010 obtained for the following variables consumer price index (Headline), money supply, Gross Domestic Product (GDP), exchange rate, minimum rediscount rate/ monetary policy rate, US CPI as a proxy for import price. The data for the study is obtained from Central Bank of Nigeria (CBN) Statistical Bulletin,2010, CBN Annual Reports and Statement of Account (various years), national Bureau of Statistics (NBS) and World Data Bank (World Economic Indicators). E views econometric software is employed to handle the data manipulation.

Model Specification

The study employs a Vector Autoregressive (VAR) models to examine output variability and inflation instrument variability. In the specification of the model, in line with the works of Mordi (2008) and Valle (2002), the VAR models are specified as follows:

$LCPI_t = \alpha_1 + \beta_1 LCPI_{t-1} + \delta_1 LM2_{t-1} + Л_1 LEXR_{t-1} + \lambda_1 LGDP_{t-1} + \rho_1 LUSCPI_{t-1} + \partial_1 LINTR_{t-1} + \varepsilon_1$……1

$LM2_t = \alpha 2 + \beta_2 LCPI_{t-1} + \delta 2 LM2_{t-1} + Л 2 LEXR_{t-1} + \lambda_2 LGDP_{t-1} + \rho_2 LUSCPI_{t-1} + \partial_2 LINTR_{t-1} + \varepsilon_2$……2

$LEXR_t = \alpha_3 + \beta_3 LCPI_{t-1} + \delta_3 LM2_{t-1} + Л_3 LEXR_{t-1} + \lambda_3 LGDP_{t-1} + \rho_3 LUSCPI_{t-1} + \partial_3 LINTR_{t-1} + \varepsilon_3$……3

$LGDP_t = \alpha_4 + \beta_4 LCPI_{t-1} + \delta_4 LM2_{t-1} + Л_4 LEXR_{t-1} = \lambda_4 LGDP_{t-1} + \rho_4 LUSCPI_{t-1} + \partial_4 LINTR_{t-1} + \varepsilon_4$……4

$LUSCPI_t = \alpha_5 + \beta_5 LCPI_{t-1} + \delta_5 LM2_{t-1} + Л_5 LEXR_{t-1} + \lambda_5 LGDP_{t-1}\ \rho_5 LUSCPI_{t-1} + \partial_5 LINTR_{t-1} + \varepsilon_5$ …….5

$LMRR_t = \alpha_6 + \beta_6 LCPI_{t-1} + \delta_6 LM2_{t-1} + Л_6 LEXR_{t-1} + \lambda_6 LGDP_{t-1} + \rho_6 LUSCPI_{t-1} + \partial_6 LINTR_{t-1} + \varepsilon_6$……6

Where LCPI is the log of consumer price index, LM2 is the log of broad money supply, LEXR is the log of exchange rate, LGDP is the log of gross domestic product, LUSCPI is the log of US consumer price index while LINTR is the log of interest rate.

Econometric Tests, Data Analysis and Interpretation of Results

Ordering of Variables

The selection of the variables is done to build multivariate models which can be used to target inflation and as a forecasting instruments.

One of the basic issues to address when using VAR is the ordering of the variables. In ordering our variables, it is assumed that monetary policy variables M_2 and INTR would transmit into price and output through exchange rate while foreign price (USCPI) is the most exogenous variable in the model. For the selection of lag length, a lag length of one is selected based on Schwarz information criteria because it takes into consideration the parsimoniousness of the model and has stringer theoretical backing (Serrato, 2006).

Roots of characteristic Polynomial Test

The result of this test in the appendix when LCPI, LEXR, LGDP, LINTR, LM2 and LUSCPI are endogenous variables while the constant is the exogenous variable shows that no root lies outside the unit circle. The VAR satisfies the stability condition.

Block Exogeneity Test

Block exogeneity tests are to determine how these variables enter the model. It has as its null hypothesis that the lags of a set of variables do not enter the equation of the other variables, and, thus, it is exogenous to the model.

The block exogeneity test result in the appendix indicates that none of the variables at lag one should enter the equation of LCPI as an exogenous variable at 5 percent significant level. The values of their various probabilities are greater than the 5 percent significant level thereby accepting the null hypothesis. There is no indication of LM2 granger cause LCPI. This opposes monetary policy theory.

VAR Lag Order Criteria

To determine the optimum lag length, we begin with a lag of twenty but finally selected an optimum lag of one. We employed the sequential modified LR test, the final prediction error (FPE) test, Akaike information criterion (AIC) test, Schwarz information criterion (SIC) test and Hannan Quinn (HQ) information criterion at 5 percent level of significance to carry out the selection. All the test results in the appendix indicate a lag order of one.

Impulse Response

This section analyses the dynamic property of the model using impulse response functions. Figure 1.1 in the appendix reveals the response of CPI to a one unit shock to USCPI, GDP, CPI itself, EXR, LM2 and INTR. While figure 1.2 reveals the response of GDP to a one unit shock to USCPI, GDP, CPI, EXR, LM2 and INTR. The graphs in the appendix show that a positive shock to CPI itself decreased CPI throughout. While a positive shock to exchange rate increased CPI throughout. This shows that the theory of exchange rate pass through. CPI did not respond to interest rate but a positive shock to GDP led to a decline in CPI. This is in line with economic theory of inflation and output having an inverse relationship. LCPI did not also respond to foreign price proxied by USCPI while a positive shock to LM_2 led to a decline in CPI. This is in consonant with the work of Mordi (2007) where the use of monetary aggregates as intermediate monetary target was questioned.

Variance Decomposition

This section has to do with assessing the relative contribution of the variables to the fluctuation in prices and GDP. This is done by decomposing the forecast variance of the inflation rate and GDP over different horizons. The statistics in table 2.1 and 2.2 in the appendix indicate the percentage contribution of innovations in each of the variables to the variance decomposition of CPI and GDP.

Variance decomposition to CPI shows that shocks to exchange rate are important source of variation in CPI, accounting for 27.17 percent shocks in prices after 10 period, while own shocks explained 59.51 percent. GDP and USCPI accounted for just 4.09 and 3.72 percents respectively. This is in line with the open economy paradigm that exchange rates news affects forecast of future inflation. Not much can be said of LM_2 and INTR which is inconsistent with the use of monetary aggregates as intermediate monetary targets. it is also not in line with the monetary precepts which states that the expansion of bank lending and hence of the money supply leads to an increase in expenditure that in turn puts further pressure on prices in an open-ended process that epitomized the inherent instability of credit.

Variance decomposition of EXR shows that shocks to CPI and GDP are important sources of fluctuation in EXR accounting for 25.30 and 11.44 percents respectively.

Variance decomposition of GDP reveals that apart from itself which accounted for 27.15 percent, EXR and CPI are major sources of fluctuation in EXR accounting for 36.42 and 21.83 percents respectively. This is also in line with the open economy paradigm and economic theory of inflation and growth.

Not much can be attributed to interest rate. In fact the findings is not in line with Keynesian precepts which states that fiscal policy is seen as the primary tool of macroeconomic stabilization, while interest rate is to be set low to encourage investment, and credit controls employ to restrain consumer borrowing.

Conclusion

An inflation target clearly provides a nominal anchor for the path of the price level, and, like a fixed exchange rate anchor, has the important advantage of being easily understood by the public. The resulting transparency increases the potential for promoting low inflation expectations, which helps to produce a desirable inflation outcome. Also, like a fixed exchange rate or a monetary targeting strategy, inflation targeting reduces the pressure on the monetary authorities to pursue short-run output gains that would lead to the time-inconsistency problem. An inflation-targeting strategy also avoids several of the problems arising from monetary targeting or fixed exchange rate strategies. For example, in contrast to a fixed exchange rate system, inflation targeting can preserve a country's independent monetary policy so that the monetary authorities can cope with domestic shocks and help insulate the domestic economy from foreign shocks. In addition, inflation targeting can avoid the problem presented by velocity shocks because it eliminates the need to focus on the link between a monetary aggregate and nominal income; instead, all relevant information may be brought to bear some forecasting inflation and choosing a policy response to achieve a desirable inflation outcome.

Based on the findings and policy implications from this study, the following recommendations are proffered:

(i) making the objective of monetary policy clear and thereby improving planning in the private and public sectors;

(ii) since the impact of shocks to most of the variables on CPI and GDP is immediate, CBN should critically and carefully evaluate policy options before implementing them;

(iii) since the study established a stable relationship between inflation and monetary policy instruments, the plan of the Bank to transit to inflation targeting framework of monetary policy is appropriate. However, other preconditions, such as CBN autonomy, absence of fiscal dominance, non-reliance on seignior age as a means of financing government deficit, Exchange rate targeting, among other should be reconsidered;

(iv) in the VAR model, it is observed that exchange rate contributes significantly to inflationary pressure in Nigeria, which is a reflection of the import-dependent nature of the economy. Hence, the need to

develop the real sector of the economy through incentives that will induce investment becomes necessary. This is necessary as inflation cannot be targeted without a robust real sector.

The study examined the achievement of sustainable growth through inflation targeting using the VAR models. The innovation analysis showed that shocks to exchange rate have a significant effect on prices and GDP. The major conclusion from the VAR analysis is that the basic transmission mechanism runs from exchange rate to prices which is in- line with the open economy paradigm which states that exchange rate news affects forecasts of future inflation.

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APPENDIX

Roots of Characteristic Polynomial
Endogenous variables: LCPI LEXR LGDP LINTR LM2 LUSCPI
Exogenous variables: C
Lag specification: 1 2
Date: 12/03/12 Time: 13:54

Root	Modulus
0.991870	0.991870
0.902903 - 0.025181i	0.903254
0.902903 + 0.025181i	0.903254
0.535307 - 0.556582i	0.772229
0.535307 + 0.556582i	0.772229
0.399383 - 0.543734i	0.674650
0.399383 + 0.543734i	0.674650
-0.296906 - 0.600957i	0.670300
-0.296906 + 0.600957i	0.670300
-0.247198 - 0.195414i	0.315108
-0.247198 + 0.195414i	0.315108
0.293727	0.293727

No root lies outside the unit circle.
VAR satisfies the stability condition.

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VAR Granger Causality/Block Exogeneity Wald Tests
Date: 12/03/12 Time: 13:55
Sample: 1981 2010
Included observations: 28

Dependent variable: LCPI

Excluded	Chi-sq	df	Prob.
LEXR	3.333773	2	0.1888
LGDP	1.634639	2	0.4416
LINTR	0.111896	2	0.9456
LM2	4.127249	2	0.1270
LUSCPI	2.491206	2	0.2878
All	13.98498	10	0.1737

Dependent variable: LEXR

Excluded	Chi-sq	df	Prob.
LCPI	3.958352	2	0.1382

LGDP	2.128730	2	0.3449
LINTR	1.006630	2	0.6045
LM2	1.057619	2	0.5893
LUSCPI	4.672536	2	0.0967
All	14.44377	10	0.1537

Dependent variable: LGDP

Excluded	Chi-sq	df	Prob.
LCPI	7.131852	2	0.0283
LEXR	4.693196	2	0.0957
LINTR	1.108403	2	0.5745
LM2	1.073039	2	0.5848
LUSCPI	1.748511	2	0.4172
All	25.93280	10	0.0038

Dependent variable: LINTR

Excluded	Chi-sq	df	Prob.
LCPI	2.066743	2	0.3558
LEXR	5.405964	2	0.0670
LGDP	2.916790	2	0.2326
LM2	2.578568	2	0.2755
LUSCPI	4.212443	2	0.1217
All	16.37803	10	0.0893

Dependent variable: LM2

Excluded	Chi-sq	df	Prob.
LCPI	5.357578	2	0.0686
LEXR	1.253231	2	0.5344
LGDP	2.619396	2	0.2699
LINTR	1.067119	2	0.5865
LUSCPI	2.709479	2	0.2580
All	17.26654	10	0.0687

Dependent variable: LUSCPI

Excluded	Chi-sq	df	Prob.

LCPI	7.896494	2	0.0193
LEXR	6.808634	2	0.0332
LGDP	3.365834	2	0.1858
LINTR	0.501779	2	0.7781
LM2	6.647061	2	0.0360
All	20.74597	10	0.0229

VAR Lag Order Selection Criteria
Endogenous variables: LCPI LEXR LGDP LINTR LM2 LUSCPI
Exogenous variables: C
Date: 12/03/12 Time: 13:47
Sample: 1981 2010
Included observations: 28

Lag	LogL	LR	FPE	AIC	SC	HQ
0	5.229846	NA	4.26e-08	0.055011	0.340483	0.142283
1	200.6896	293.1897*	5.14e-13*	-11.33497*	-9.336667*	-10.72407*
2	235.0943	36.86218	8.56e-13	-11.22102	-7.509883	-10.08649

* indicates lag order selected by the criterion
LR: sequential 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

Table 2.1: **Variance Decomposition**

Variance Decomposition of LCPI:

Period	S.E.	LCPI	LEXR	LGDP	LINTR	LM2	LUSCPI
1	0.120813	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.204794	95.93079	0.078733	0.723502	0.295924	0.328807	2.642244
3	0.243184	88.20678	2.380893	3.402026	0.501050	1.576480	3.932772
4	0.259209	80.57724	9.034666	3.965917	0.928435	1.893638	3.600103
5	0.271079	73.70817	16.01735	3.633286	1.515254	1.731889	3.394053
6	0.280450	68.95594	20.58487	3.570472	1.547651	1.795101	3.545966
7	0.287434	65.64775	23.03100	3.921405	1.498364	2.105879	3.795609
8	0.293244	63.39789	24.39905	4.188042	1.632985	2.527082	3.854952
9	0.298849	61.56827	25.62854	4.177260	1.907442	2.921919	3.796565
10	0.304721	59.51215	27.16616	4.093508	2.175264	3.328746	3.724171

Variance Decomposition of LEXR:

Period	S.E.	LCPI	LEXR	LGDP	LINTR	LM2	LUSCPI
1	0.319617	2.914321	97.08568	0.000000	0.000000	0.000000	0.000000
2	0.394763	15.24355	75.21043	7.330079	0.003090	2.182690	0.030159
3	0.450641	22.25932	61.22222	11.91162	1.203437	2.624913	0.778488
4	0.471073	25.91845	56.55677	12.28420	1.108145	2.407247	1.725192
5	0.477509	25.44685	55.09594	12.43298	1.485983	2.737165	2.801085
6	0.483346	25.78126	53.82974	12.13454	1.909888	3.360660	2.983916
7	0.489838	26.20561	52.87731	12.10655	2.306703	3.580173	2.923648
8	0.495193	25.80643	53.19795	12.01702	2.441823	3.646896	2.889885
9	0.501318	25.30816	53.95977	11.73185	2.406923	3.681221	2.912075
10	0.508873	25.29865	54.17426	11.43622	2.351555	3.707615	3.031709

Variance Decomposition of LGDP:

Period	S.E.	LCPI	LEXR	LGDP	LINTR	LM2	LUSCPI
1	0.140744	9.115005	0.193192	90.69180	0.000000	0.000000	0.000000
2	0.182713	24.47812	9.990683	62.85865	0.228233	0.096247	2.348071
3	0.211265	31.82549	14.19576	48.94064	2.999603	0.237172	1.801345
4	0.228337	27.48196	20.15799	44.54758	3.620489	2.644612	1.547371
5	0.245190	25.41224	26.31219	38.82269	3.674238	3.346391	2.432254
6	0.259707	24.84386	29.71555	34.60391	3.840167	3.015362	3.981153
7	0.270739	24.59105	31.65099	31.87416	3.558622	2.800521	5.524655
8	0.279330	23.72603	33.16374	29.95785	3.418173	2.767165	6.967043
9	0.286522	22.72301	34.70085	28.51911	3.368378	2.827868	7.860785
10	0.294410	21.83094	36.42481	27.15408	3.341427	2.832609	8.416137

Variance Decomposition of LINTR:

Period	S.E.	LCPI	LEXR	LGDP	LINTR	LM2	LUSCPI
1	0.187067	8.310314	9.944620	3.763429	77.98164	0.000000	0.000000
2	0.207228	6.773399	12.49196	14.06315	63.67250	1.796917	1.202068
3	0.221020	12.78912	14.97511	12.64429	56.44243	1.978233	1.170818
4	0.250470	25.93548	14.79945	9.911968	45.36858	1.619613	2.364912
5	0.265280	26.39474	13.76425	12.62782	40.59286	2.783530	3.836803
6	0.267871	26.21963	13.52272	12.95406	40.01607	3.441931	3.845587
7	0.269639	25.92052	13.36855	12.81273	40.52969	3.540077	3.828427
8	0.270586	25.79147	13.27589	12.79606	40.61382	3.707252	3.815507
9	0.270902	25.73171	13.28058	12.77025	40.59341	3.811412	3.812643
10	0.271484	25.80403	13.34388	12.71618	40.49188	3.845264	3.798771

Variance

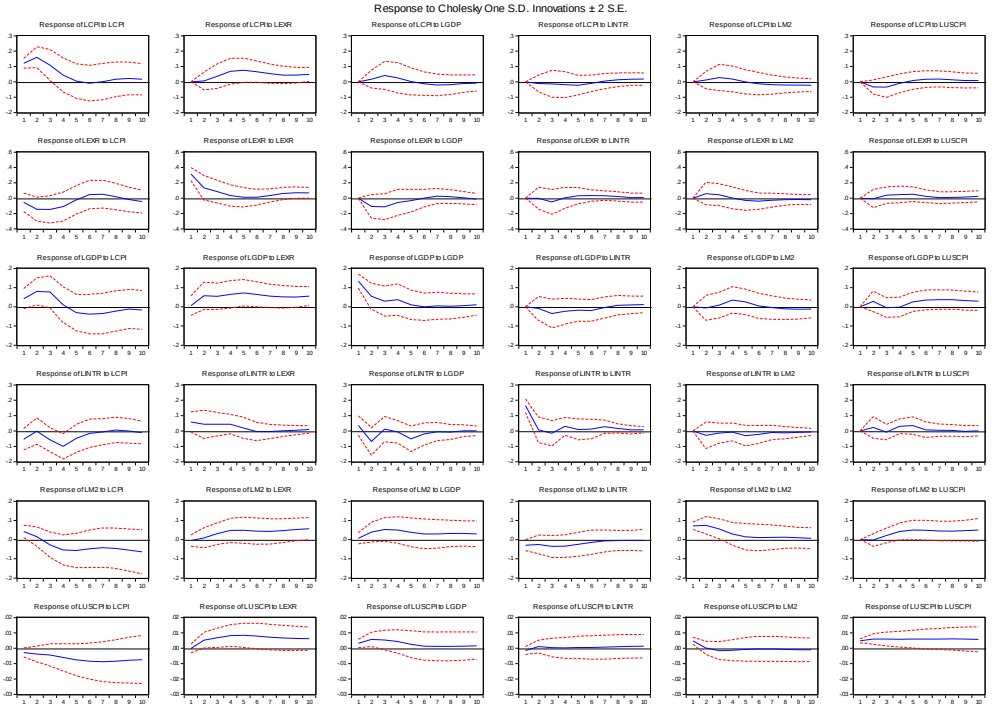
Decomposition of LM2:

Period	S.E.	LCPI	LEXR	LGDP	LINTR	LM2	LUSCPI
1	0.088887	22.69650	0.269166	0.620606	11.01648	65.39725	0.000000
2	0.126442	12.70616	0.594085	9.946148	9.571706	67.14508	0.036822
3	0.159192	10.91909	4.152231	17.42536	11.06270	54.60409	1.836519
4	0.191832	15.36660	8.999392	18.74838	10.86131	39.99091	6.033395
5	0.217157	18.87257	12.01191	17.66065	9.762218	31.65127	10.04138
6	0.234469	20.36622	13.82505	16.75428	8.748626	27.35475	12.95107
7	0.248300	21.05057	15.26362	16.35361	7.886581	24.62184	14.82379
8	0.262719	21.80684	16.76840	16.07571	7.072771	22.21357	16.06272
9	0.279429	23.10721	18.35726	15.52714	6.273963	19.76415	16.97028
10	0.298007	24.93146	19.76122	14.62717	5.531218	17.42265	17.72628

Variance Decomposition of LUSCPI:

Period	S.E.	LCPI	LEXR	LGDP	LINTR	LM2	LUSCPI
1	0.008142	11.50069	0.030481	14.77699	3.203173	34.77099	35.71768
2	0.013352	12.31669	15.74897	23.92599	1.838154	12.94840	33.22179
3	0.017630	13.25770	24.04504	22.89230	1.106862	8.188614	30.50949
4	0.021683	16.41173	30.38279	19.18299	0.741070	5.780965	27.50045
5	0.025341	21.02604	33.31099	15.12974	0.585844	4.314081	25.63330
6	0.028531	25.27872	33.95545	12.17723	0.487760	3.428771	24.67208
7	0.031327	28.73987	33.51176	10.24993	0.452996	2.864740	24.18071
8	0.033751	31.07833	32.84937	8.968847	0.485237	2.508127	24.11009
9	0.035804	32.44162	32.36770	8.122950	0.544558	2.297777	24.22539
10	0.037606	33.29357	32.08149	7.555662	0.612775	2.156386	24.30011

Cholesky Ordering: LCPI LEXR LGDP LINTR LM2 LUSCPI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