Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.8, No.7, 2017

Inflation Targeting as A Monetary Policy in Nigeria: An Application of Vector Autoregressive (VAR) Model

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Abstract
This work seeks to explore the applicability of inflation targeting in the Nigerian economy based on time series data from 1990Q1 to 2014Q4. Although the conditions for its successful take off has been identified in the literature; this work empirically examined the predictable relationship between monetary policy instrument and inflation. Unit root test, Co-integration test, unrestricted VAR methodology as well as impulse response analysis with five variables in a 2 lag specifications were employed. The impulse response functions from the VAR model show that the response of Consumer Price Index (cpi) to its own shocks is contemporaneously very strong and remain so throughout the short and medium term horizons, but, less persistent afterwards. The response of cpi to innovations in money supply (liquidity channel) and interest rate (interest rate channel) were found to be less significant. This was reinforced by results from variance decomposition of the cpi where the latter two accounted for less than 15 percent of the variance of the former in both the short and medium term. This goes to show that while expansionary monetary policy, which works through the liquidity channel, positively affects prices in the economy, inflationary pressure is usually followed by contractionary monetary measures in the economy. The response of cpi to positive innovation in output is counterintuitive implying that an in increase in productivity rather leads to decline in prices generates more inflationary pressures in the economy while the response of output to shocks in cpi is more consistent and gives a dynamic link. The research also found out that the exchange rate is face with the problem of exchange rate pass-through in Nigeria, because of the level import tendencies in economy. This implies that inflation in other countries are imported to the country through high demand import of goods and service by many Nigerians. Therefore, the paper recommends that government should use exchange rate as inflation targeting instrument in Nigeria to reduce the level of imported inflation for economic growth in Nigeria.
Keywords: Inflation, Targeting, Monetary Policy, Inflationary, Exchange Rate

1. INTRODUCTION

The application of monetary policy strategies toward achieving macroeconomic objectives has been a dominant feature of economic management over the years. In this regard, the two main strategies of monetary policy, monetary aggregates target and inflation targeting, have been adopted at different point in time across different countries. However, the adoption of inflation targeting (IT) has grown in acceptance ever since it was first adopted by New Zealand in 1989, as quite a number of industrialized countries have followed suit in the early 1990s, in addition to a growing number of emerging markets and developing countries. As of late 2006, 24 countries are classified as inflation targeters, including 8 industrial countries and 16 emerging markets and developing countries. According to Batini & Laxton (2007) prominent among the industrialized countries that have adopted inflation targeting (IT) are United Kingdom, New Zealand, Canada, Sweden, Norway , Switzerland, Iceland and Austria; while early adopters of IT in emerging market economies include South Korea, Brazil, Mexico, Poland, Czech Republic, Thailand, South Africa, Colombia, Hungary, Chile, Israel, and Peru**.**

Arestis and Sawyer (2003) refer inflation targeting to be the 'New Monetary Policy', which is characterized by: a numerical and official inflation target; monetary policy exercised through interest rates; an independent central bank; and no other objectives of monetary policy and this policy is to maintain reduced inflation or price stability in the economy. Khalid (2005) said that inflation distorts resource allocation in the economy. It hurts the poorest members of society disproportionately and creates uncertainty, as well as arbitrarily re-distributes income and wealth. It undermines macroeconomic stability and makes sustained rapid growth impossible to achieve. High level of inflation disrupts the smooth functioning of a market economy (Krugman, 1995). At the individual level, inflation exerts a heavy toll on those with fixed income; inflation relatively favours debtors at the expense of creditors, at the firm level; the effect of inflation is called the 'menu cost' Caballero, Ricardo and Arvind Krishnamurthy (2005). This is because it affects output when firms have to incur costs as they adjust to the new price level (e.g. changing their price lists for the customer).

In Nigeria, inflationary pressures reflecting in persistently rising prices have been an issue of concern to the policy authorities since the late 1960s. Nigerian economy has on the average experienced moderate inflation in the pre-SAP period (1960–1972), the historical average, rate being 5.01% and relative slow-down of the inflation rate to 7.7% in 1982, (Blanchard, 2005). The unfavourable consequences of inflation have since assumed an intolerable dimension. Several authorities have attributed it to the expansion of public expenditure arising from the increase in oil revenue, which culminated into a vast expansion of aggregate demand and the

inelastic supply of domestic output (Tsenkwo, 2010). Inflation is often economically undesirable primarily because all spending units hardly adjust at equal speed, thereby leading to arbitrary distribution of income from the more slowly adjusting sectors to the more rapidly adjusting sectors. By implication, anticipated inflation occurs when allowances for price rise is built into future contracts due to sustained inflationary trends.

Bearing in mind this damaging effect of inflation in an economy, there are various policy measures embarked upon by every government in order to see that these distinctive negative effects are checked or curbed and kept at a barest minimal level. These policy measures are referred to as macroeconomic policies. The targets of these macroeconomic policies usually represent the quantity expression of macroeconomic objectives which are normally fixed by the authorities who are believed to be in a position to know what this set of variables should be. These variables being the problem which the objectives are set to correct; according to Uchendu (2009) countries differ widely in specific circumstances ;the size and openness of the country to trade and financial flows, structure of its production and exports, stage of its financial development, its inflationary history and the nature and sources of shocks that it faces; policymakers' preferences for trade- offs among the main policy objectives (like inflation and output), the credibility of its institutions, level of development and socio-political environment. All these help to shape what inform the policy strategy appropriate for that country at that time and this can change with changing circumstances. Thus, in Nigeria, through the 1970s and well into the first half of 1980s, anti-inflation policy became a regular feature of government's overall economic policy agenda. Inflationary pressures heightened substantially after the adoption of the Structural Adjustment Programme in 1986 with the inflation rate rising as high as 56.0 percent and 50.0 percent in 1988 and 1989 respectively.

Despite a mild respite in 1990 with a single digit rate of 7.0 percent ,the inflationary rate climbed up steadily to about 44.0 percent in 1992 and as high as 72.0 percent in 1995. In its efforts to stem the problem of inflation in Nigeria, the policy authorities have over the years used a combination of several measures ranging from wage freeze, price controls, direct involvement of government in the procurement and distribution of essential commodities, to fiscal and monetary strategies (Uchendu, 2009). And despite the government effort in adoption of monetary policies in Nigeria over the years to combat inflation rate and its effects on the economy, it seems the music has not change its tone. The economy is still faced with problem of inflation and unemployment. Then amidst these numerous problems of inflation and numerous control measures adopted over the years there is a new phenomenon called {inflation Targeting }which advocates a new strategy where by these inflation problems are being tackled through monetary policy strategy and is making waves among industrialized economies as well as developing economies like Nigeria.

Although there are conditions or pre-requisite for adoption, the result from their adoption have been positive and clearly substantial in tackling some of the inflation problems in these countries, reducing their inflation rate as well as maintaining reasonable stable prices. Given these conditions and the challenges it poses to developing countries like ours, this study seek to find out what we are doing in terms of embracing this new phenomenon in the way of ascertaining whether a predictable relationship exist between the monetary instruments and inflation as key instruments to inflation targeting? To achieve this the paper is sub-divided into five sections, which are introduction, literature review, methodology, discussion of results and conclusion and recommendations.

2. LITERATURE REVIEW

According to Mordi (2009), monetary policy is a blend of measures and, or a set of instruments designed by the Central Bank to regulate the value, supply and cost of money consistent with the absorptive capacity of the economy or the expected level of economic activity without necessarily generating undue pressure on domestic prices and the exchange rate. In other words, the ultimate goal of monetary policy, is to ensure the achievement of consistency between the expansion of domestic liquidity and government's macroeconomic objectives of price and exchange rate stability higher output growth, full employment of resources, balance of payment equilibrium, promotion of a sound financial system and sustainable growth and development. From the definition of monetary policy above, monetary policy rests on the relationship between the rates of interest in an economy, that is, the price at which money can be borrowed, and the total supply of money. It uses a variety of tools to control one or both of these, to influence outcomes like economic growth, inflation, exchange rates with other currencies and unemployment. According to Orubu, (2009) inflation refers to the persistent and sustained rise in general level of prices of goods and services in an economy, manifesting visibly in the decline of the value of money. Price stability in itself does not mean that an economy records zero rise in general price level of goods and services but some degree of price inflation is regarded as normal and therefore needed for development in a growing economy as long as such price increase is within the range of low single digits.

The Bank of England (2009) defines inflation targeting as "a monetary policy strategy aimed at maintaining price stability by focusing on deviations in published inflation forecasts from an announced inflation target" (ECB, 2004). They believe that in an inflation targeting regime, the inflation forecast is central to policy making and presentation: the Central Bank "communicate[s] monetary policy decisions in terms of a more or

less mechanical reaction to deviations in a forecast for a particular measure of inflation from a specific inflation target at a particular horizon. In summary, Inflation targeting is a forward looking policy regime that relies strongly on rational expectation of monetary policy transmission mechanism. The way IT is implemented in emerging economies suggests that they have in general provided some discretionary power to the central bank to make some adjustments in monetary instruments.

Mishkin & Savastano, (2008) investigated the changes in the monetary policy transmission mechanism in Colombia in the period 1989 to 2007 with a modified small open economy DSGE model introduced in order to study the theoretical changes using a Markov switching VAR model in order to compute and compare impulse responses The results show that there is a clear difference between volatilities among the regimes and in particular the inflation targeting regime and is characterized by a low volatility of inflation and the interest rate. Another interesting finding is that transmission mechanism of monetary policy has become more effective in lowering inflation and interest rate volatility. However, the increased focus on inflation has brought increased volatility to exchange rate while keeping the one of output relatively constant.

Kadioglu, Ozdemir &Yilmaz (2009) investigated the interaction among interest rate, inflation and output under inflation targeting regime in Turkey for the years between 2002-2006, using impulse response functions in Vector Autoregressive (VAR) analysis and Johansen co-integration Method to find out whether there is a short and a long term relationship among inflation, interest rate and production, and whether the inflation rate is affected by the changes in interest rate and production under IT regime in Turkey. The impulse responses based on the model dynamics reveal that the increase in interest rates will lead to a decline in inflation rates by decreasing the aggregate demand in Turkish economy. Besides, by the co integration analysis, it is found out that there is a long-term relationship among inflation, interest rate and output. The findings also reveals that the interest rate is effective in the transmission mechanism under inflation targeting regimes and, in order to achieve the targeted inflation rate, the interest rate channel in which a short-term interest rate is used as a monetary policy instrument has a high importance.

Poon et.al (2011), investigate the applicability of inflation targeting (IT) in ASEAN countries, focusing on the role of the real exchange rate and exchange rate volatility, and the central banks' reaction functions. Results illustrate that both IT and non-IT ASEAN countries responds significantly to inflation gap; but neither IT nor Non-IT groups respond significantly to the output gap in setting the interest rates. Comparatively, the role of real exchange rate is more significant in Non-IT countries than in IT countries. IT countries appear to follow a "mixed strategy" as both inflation and real exchange rate are important determinants when it comes to setting of interest rates. Results demonstrate that inflation targeters have lower exchange rate volatility compared to non-inflation targeters, which implies that IT does not seem to come as a "cost" to domestic economy with respect to higher exchange rate volatility

Englama & Aliyu, (2009) evaluates whether Nigeria is ready to adopt inflation targeting (IT), a monetary policy framework that several emerging markets have adopted over the last one decade. Applying Vector Autoregressive (VAR) model to some select monetary policy and other macroeconomic variables to explore the various channels using the Granger causality tests, impulse responses, and variance decomposition, the results show that inflation in Nigeria is impassive to monetary transmission variables in the model. Specifically, weak link between prices and credit and interest rate channels were established. However, evidence of strong inverse link between exchange rate and prices was found in the model. He therefore concluded and recommends the pursuance of IT lite in Nigeria.

3. METHODOLGY

3.1 Sources and methods of data analysis

The data used for this study are purely secondary and are sourced from Central Bank of Nigeria statistical bulletin, Economic and Financial Review and Annual Reports; National Bureau of Statistics publications; International Financial Statistics published by IMF and World Bank publications and Financial Indicators were also used. The data being analyzed using the Econometric views (e-view version 7.1). Stationarity of the data was checked, that is, the data will be tested for unit root by using the Augmented Dickey Fuller test. Multiple Regression analysis will be used to analyze the data. In estimating the model, we shall use the Ordinary Least Square (OLS) regression analysis to show the relationship between the variables.

3.2 Model Specification

This study adopts VAR model analysis following Gottschalk and Moore (2001), Tutar (2002) and, more recently, by Batini & Laxton (2007), Englama & Aliyu, (2009) to estimate the transition mechanism of monetary policy variables to inflation targeting in Nigeria. The main indicators in the VAR framework of inflation targeting as adopted from the study of Englama & Aliyu, (2009) are: Consumer price index, gross domestic product, money supply (M2), interest rate, exchange rate, fiscal balance, ratio of credit to money supply, treasury bills rate and lending rate. The work of Englama & Aliyu, (2009) originally considered gross domestic product, consumer

price index, domestic money supply, fiscal spending, interest rate and exchange rate as endogenous variables in their analysis. The variables are hereby modified to exclude fiscal spending as the current study focus on monetary policy transmission mechanism.

The econometric analysis starts with a monetary VAR model which includes the nominal exchange rate (ER), domestic money supply and the interest rate as policy variables while the Gross Domestic Product (GDP) and the Consumer Price Index (CPI) as the output and price (targeted) variables respectively. The equations of the VAR model for the economy are given by:

$$Y_t = \alpha_1 + \sum_{i=1}^{k} \lambda_{1j} Y_{t-j} + \sum_{i=1}^{k} \lambda_{2j} CPI_{t-j} + \sum_{i=1}^{k} \lambda_{3j} DMS_{t-j} + \sum_{i=1}^{k} \lambda_{4j} ER_{t-j} + \sum_{i=1}^{k} \lambda_{5j} IR_{t-j} + \mu_{1t} \quad \ldots\ldots 1$$

$$CPI_t = \alpha_2 + \sum_{i=1}^{k} \gamma_{1j} CPI_{t-j} + \sum_{i=1}^{k} \gamma_{2j} Yt_{t-j} + \sum_{i=1}^{k} \gamma_{3j} DMS_{t-j} + \sum_{i=1}^{k} \gamma_{4j} ER_{t-j} + \sum_{i=1}^{k} \gamma_{5j} IR_{t-j} + \mu_{2t} \quad \ldots\ldots 2$$

$$DMS_t = \alpha_3 + \sum_{i=j}^{k} \delta_{1j} DMS_{t-j} + \sum_{i=j}^{k} \delta_{2j} Y_{t-j} + \sum_{i=j}^{k} \delta_{3j} CPI_{t-j} + \sum_{i=j}^{k} \delta_{4j} ER_{t-j} + \sum_{i=j}^{k} \delta_{5j} IR_{t-j} + \mu_{3t} \quad \ldots\ldots 3$$

$$ER_t = \alpha_4 + \sum_{i=j}^{k} \varepsilon_{1j} ER_{t-j} + \sum_{i=j}^{k} \varepsilon_{2j} Yt_{t-1} + \sum_{i=j}^{k} \varepsilon_{3j} CPI_{t-j} + \sum_{i=j}^{k} \varepsilon_{4j} DMS_{t-j} + \sum_{i=j}^{k} \varepsilon_{5j} IR_{t-j} + \mu_{4t} \quad \ldots\ldots 4$$

$$IR = \alpha_5 + \sum_{i=j}^{k} \theta_{1j} IR_{t-j} + \sum_{i=j}^{k} \theta_{2j} Yt_{t-j} + \sum_{i=j}^{k} \theta_{3j} CPI_{t-j} + \sum_{i=j}^{k} \theta_{4j} DMS_{t-j} + \sum_{i=j}^{k} \theta_{5j} IR_{t-j} + \mu_{5t} \quad \ldots\ldots 5$$

Where:
Y_t = Gross Domestic Product (GDP)
CPI = Consumer Price Index
DMS = Domestic Money Supply
ER = Exchange Rate
IR = Interest Rate
a, b, c, d & e = Parameters
U_t = Error term

α_I is the intercept term of equation i, Y_{t-j} represents the lag values of GDP, CPI_{t-j}- lag values of Consumer price index, DMS_{t-j}- lag values of Domestic debt, ER_{t-j}- lag values of exchange rate, IR_{t-j}- lag values of interest rate, k- lag length, j- lag order, μ_{it}- error term of model i (where i = 1-5) which is expected to be independently, identically, distributed as a white noise process.

4. DISCUSSION OF RESULTS

4.1 Stationarity Test

Table 4.1: Summary of Unit Root Test

Var.	5% level	Critical ADF	Order of integration	Remarks
GDP	-3.320969	-2.25821	I (2)	Not Stationary
CPI	-3.020686	-6.60156	I (2)	Second difference
DMS	-3.05217	1.27561	I (2)	Not Stationary
ER	-2.99806	-4.98339	I (1)	First difference
IR	3.00486	-4.71893	I (1)	First difference

Source: Extract from E-views 7.0

The table above reports stationarity results tests for the macroeconomic variables used in the study. As the analysis reveals, none of the variables are stationary at levels. After first difference, exchange rate (ER) and interest rate (IR) are statistically significant after first difference, while Consumer Price Index (CPI) is stationary after second difference. However, Gross Domestic Product (GDP) and Domestic Money Supply (DMS) are not statistically stationary even after second difference.

4.2. The Cointegration Analysis Results and Interpretation

Since the results of the unit root tests above comfirm the non-stationarity of the variables in the VAR model, we can then apply the Johansen and Juselius method for testing of cointegration. According to this approach, we must first determine the lag length of the VAR which must be small enough to allow estimation and high enough to ensure that errors are approximately white noise. Using five different information criteria that include: Sequential Modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information criterion (SC) and the Hannan-Quinn Information Criterion (HQ); we conclude that the optimal lag length for our models is two.

Table 4.2: VAR Lag Order Criteria
Endogenous variables: GDP CPI DMS ER IR
Exogenous variables: C
Date: 01/10/15 Time: 08:25
Sample: 1986 2014
Included observations: 22

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-718.4294	NA	5.58e+28	80.38104	80.62837	80.41514
1	-617.2144	134.9533	1.34e+25	71.91271	73.39666	72.11733
2	-562.5471	42.51896*	1.17e+24*	68.61635*	71.33693*	68.99148*

* 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
Source: Generated from E-views 7.1(2015)

To determine the number of the co integrating vectors, we made use of both Trace Test and the Maximum Eigen-value test using the more recent critical values of MacKinon-Haug-Michelis (1999). In the case of our model, both tests identify one co-integrating vector at the 5% critical level as presented in the next two tables below. The co integration in the case of our model is for the case where we have no deterministic trend. The suitability of this choice was tested using Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC).

Since the results from the unit root tests suggests that our key variables are non-stationary and also the figures from the above lag selection criteria suggesting the possibility of a long run relationship among the variables, we therefore proceed to conduct the Johansen's co-integration test as shown below:

Table 4.3: Co-Integration Test
Date: 01/10/15 Time: 14:07
Sample (adjusted): 1990 2014
Included observations: 22 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP CPI DMS ER IR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.988461	127.2152	69.81889	0.0000
At most 1	0.762295	46.89898	47.85613	0.0613
At most 2	0.474438	21.03794	29.79707	0.3553
At most 3	0.406868	9.458775	15.49471	0.3246
At most 4	0.003144	0.056672	3.841466	0.8118

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.988461	80.31624	33.87687	0.0000
At most 1	0.762295	25.86104	27.58434	0.0817
At most 2	0.474438	11.57917	21.13162	0.5895
At most 3	0.406868	9.402103	14.26460	0.2542
At most 4	0.003144	0.056672	3.841466	0.8118

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDP	CPI	DMS	ER	IR
6.91E-05	0.000760	-6.46E-06	0.028261	0.001547
2.55E-05	0.031238	-1.51E-06	0.001503	0.357226
1.04E-05	-0.087097	-3.53E-07	0.069758	-0.600527
2.24E-05	-0.076905	-7.35E-08	0.040941	0.067204
6.31E-05	-0.003755	-2.64E-06	-0.024349	0.023291

Source: Authors Computation using E-views 7.1

As the result shows, both Trace and Max-Eigen tests indicate one cointegrating equation at the 5% level of significance; thus reject the null hypothesis of absence of any cointegrating equation. This implies that a long run relationship exist among the variable sets even though they are individually non-stationary at level. Next we proceed with our VAR models estimation.

4.3 Vector Autoregressive (VAR) Estimation/Interpretation

The Vector Autoregressive (VAR) model is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables**.** The VAR, approach as noted earlier in the previous section, sidesteps the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all the endogenous variables in the system. As may be observed from the table below, the variables and their different lag periods are presented in the first column.

The values enclosed in the block shape bracket ([ ]) are the t-statistics, while those in parentheses ( ) are the standard errors. However, to adjudge whether the past values of any endogenous variable is significant (or not significant) in determining its own or any other endogenous variable's present value, the t-statistic value is usually compared against its critical value (1.96 or 2).

If the t-statistic of a variable is greater than or equal to 1.96, we conclude that the lagged period value of the variable is significant in determining either its own present value or that of another endogenous variable. We adopt the VAR model in this study because the methodology places no a priori structural restriction and it captures empirical regularities in the data by making it well suited for evaluating the interdependences that exist among variables. Our VAR model consists of five variables: GDP, CPI, DMS, ER, and IR.

Table 4.4: Vector Autoregressive (VAR) Estimates

Date: 01/10/15 Time: 08:27					
Sample (adjusted): 1990 2014					
Included observations: 22 after adjustments					
Standard errors in ( ) & t-statistics in [ ]					
	GDP	CPI	DMS	ER	IR
GDP(-1)	-0.802411	-0.000319	-17.35618	0.000147	3.96E-06
	(0.35367)	(9.2E-05)	(6.72492)	(0.00037)	(7.0E-05)
	[-2.26882]	[-3.46000]	[-2.58088]	[0.40169]	[0.05676]
GDP(-2)	0.223057	0.000331	14.75083	-0.000465	-6.26E-05
	(0.38361)	(0.00010)	(7.29421)	(0.00040)	(7.6E-05)
	[0.58147]	[3.31030]	[2.02227]	[-1.17511]	[-0.82665]
CPI(-1)	2235.428	1.889224	13567.79	-1.099890	-0.294928
	(1521.75)	(0.39611)	(28935.6)	(1.57053)	(0.30054)
	[1.46898]	[4.76943]	[0.46890]	[-0.70033]	[-0.98132]
CPI(-2)	-1755.248	-0.885512	-2639.685	1.235770	0.139177
	(1616.36)	(0.42074)	(30734.6)	(1.66817)	(0.31923)
	[-1.08593]	[-2.10467]	[-0.08589]	[0.74079]	[0.43598]
DMS(-1)	0.060590	-4.96E-07	1.921660	1.21E-05	3.73E-06
	(0.02405)	(6.3E-06)	(0.45722)	(2.5E-05)	(4.7E-06)
	[2.51978]	[-0.07918]	[4.20289]	[0.48929]	[0.78573]
DMS(-2)	0.100256	5.61E-06	-0.496169	-3.90E-06	-5.40E-08
	(0.03565)	(9.3E-06)	(0.67789)	(3.7E-05)	(7.0E-06)
	[2.81218]	[0.60461]	[-0.73194]	[-0.10612]	[-0.00768]
ER(-1)	-301.0416	0.107884	-4404.730	0.829478	-0.009735
	(378.161)	(0.09844)	(7190.63)	(0.39028)	(0.07469)
	[-0.79607]	[1.09599]	[-0.61257]	[2.12532]	[-0.13035]
ER(-2)	-381.2553	-0.045575	1994.739	0.013726	0.091359
	(461.396)	(0.12010)	(8773.31)	(0.47619)	(0.09112)
	[-0.82631]	[-0.37947]	[0.22736]	[0.02883]	[1.00257]
IR(-1)	2084.468	0.351489	42693.71	-1.668293	-0.439604
	(1974.70)	(0.51401)	(37548.4)	(2.03800)	(0.39000)
	[1.05558]	[0.68381]	[1.13703]	[-0.81859]	[-1.12719]
IR(-2)	2236.992	0.701736	31627.50	-2.565229	-0.316953
	(1842.24)	(0.47954)	(35029.7)	(1.90130)	(0.36384)
	[1.21428]	[1.46337]	[0.90288]	[-1.34920]	[-0.87114]
C	-78496.51	-23.00364	-1774090.	110.9979	41.80199
	(78910.5)	(20.5404)	(1500460)	(81.4399)	(15.5846)
	[-0.99475]	[-1.11992]	[-1.18236]	[1.36294]	[2.68226]
R-squared	0.997603	0.997370	0.995337	0.944305	0.528071
Adj. R-squared	0.994180	0.993613	0.988675	0.864741	-0.146114
Sum sq. resids	2.76E+09	187.2070	9.99E+11	2942.936	107.7700
S.E. equation	19867.30	5.171447	377770.7	20.50413	3.923737
F-statistic	291.3894	265.4747	149.4152	11.86847	0.783273
Log likelihood	-195.1837	-46.61748	-248.1975	-71.41202	-41.64754
Akaike AIC	22.90930	6.401943	28.79972	9.156891	5.849727
Schwarz SC	23.45341	6.946059	29.34384	9.701007	6.393843
Mean dependent	189710.1	83.63889	2502487.	70.99264	19.27944
S.D. dependent	260418.8	64.70994	3549901.	55.75171	3.665102
Determinant resid covariance (dof adj.)		1.08E+23			
Determinant resid covariance		9.62E+20			
Log likelihood		-562.5471			
Akaike information criterion		68.61635			
Schwarz criterion		71.33693			

Source: Author's Estimation Using E-View 7.1

4.5 Interpretation of Vector Autoregressive (VAR)

Each column in the table 4.4 above corresponds to an equation in the VAR system specified in chapter three. For each lag variable, the table reports the estimated coefficient, its standard error, and the t- statistic. Also the table displays additional information below the coefficient summary. The first part of the additional output presents standard OLS regression statistics for each equation. The results are computed separately for each equation, using the appropriate residuals and are displayed in the corresponding column. The numbers at the very bottom of the table are the summary statistics for the VAR system as a whole.

The result of the VAR estimation shows that GDP in the first lag period is a negative and significant determinant of its present value (by -0.802411), that of CPI (by -0.000319) and DMS (by -17.35618); while GDP in the second-lag-period is a significant and positive determinant of only CPI (by 0.000331) and DMS (14.75083). The significance of their impact is adjudged on the basis of a t- value higher than 1.96 or 2.00.

Lag values of CPI only significantly determine its current value with positive impact running from the first-lag-period (by 1.889224) and negative impact running from the second-lag-period (-0.885512). One period lag value of DMS is a positive and significant determinant of current values of GDP (by 0.060590) and DMS (1.921660); while two-lag-value of DMS is a positive and significant determinant of current value of GDP. Similarly, first -lag period value of ER is a positive determinant of current value of ER (by 0.829478). The R-square values for current GDP, CPI, DMS, ER and IR are 0.9976, 0.9973, 0.9953, 0.9443, and 0.5281 respectively. These imply that VAR models account for 99%, 99%, 99%, 94% and about 53% of total variation in GDP, CPI, DMS, ER, and IR respectively.

4.6 Impulse Response Analysis

The impulse response analysis of the estimated VAR system is analyzed using the Cholesky one standard deviation innovations. The essence of this is to enable us to examine the dynamic interactions among our variables of interest. Unlike variance decomposition, impulse responses show the direction of these movements as well as helping us to know whether an impulse in a variable results in a fall or rise in the other variables. Examining the interactions between CPI with GDP, DMS and IR on the one hand and ER with GDP, DMS and IR, on the other hand, result shows that the response of CPI to GDP and DMS shocks maintain equal number of positive and negative directions. At first, CPI maintained a positive trend consecutively for the first three year, followed by equal number of negative trend, and two consecutive year of positive trend followed by equal year of negative trend. As for CPI response to IR shock, it was initially positive in the first few years before taking a positive turn for largest part of the remaining years. ER responds more negatively for GDP and DMS shocks, with the direction more dominant in the former from the beginning of the ten-year-period to the end than the latter which was initially positive in the first four years before becoming positive in the remaining years. However, ER responds to IR shock positively from the beginning to the end.

4.3.3 Variance Decomposition

While impulse response functions trace the effects of a shock to one endogenous variable on to the other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR. The table format displays separate variance decomposition for each endogenous variable. The second column, labelled ‘S.E’, contains the forecast error of the variable at the given forecast horizon. The source of this forecast error is the variation in the current and future values of the innovations to each endogenous variable in the VAR. The remaining columns give the percentage of the forecast variance due to each innovation, with each row adding up to 100. Again, since our interest is on the dynamic influence of monetary variables and level of output in affecting consumer price index and exchange rate, analysis of variance decomposition is done with reference to the effect of random innovation on GDP, DMS and IR in affecting CPI and ER.

Table 4.5: Variance Decomposition for Cpi

Period	S.E.	GDP	CPI	DMS	ER	IR
1	5.171447	67.66224	32.33776	0.000000	0.000000	0.000000
2	7.426072	34.79173	53.13034	1.086085	8.147895	2.843955
3	10.53589	18.54156	35.81185	0.994216	41.86918	2.783191
4	17.25787	24.05679	17.96499	1.048709	55.09141	1.838092
5	24.64730	24.48043	11.67346	1.644901	55.19860	7.002603
6	29.65418	22.49363	10.70310	1.456823	52.47281	12.87363
7	31.36933	20.12682	10.90613	1.370185	52.38810	15.20876
8	31.97912	19.61779	11.23584	1.519892	52.76196	14.86452
9	33.02941	19.82316	11.46973	1.517621	53.25500	13.93448
10	38.05946	27.90062	10.82424	2.699779	47.11715	11.45820

Source: Author's computation using E-views 7.1

Table 4.6: Variance Decomposition for Er

Period	S.E.	GDP	CPI	DMS	ER	IR
1	20.50413	6.223622	7.165255	4.329631	82.28149	0.000000
2	26.95725	4.090997	9.285080	3.647862	78.11411	4.861950
3	30.13406	3.367781	8.191563	3.408243	70.35114	14.68127
4	30.97277	5.210253	7.918971	4.321217	67.73401	14.81555
5	31.31321	6.204541	8.357967	4.228813	66.68687	14.52181
6	38.47207	26.97077	8.717004	5.480743	48.86351	9.967970
7	58.00886	48.36118	8.081580	6.988796	28.68205	7.886393
8	78.07053	52.69344	8.164118	7.331083	20.77823	11.03313
9	91.04189	53.00472	8.596412	7.270485	17.03792	14.09046
10	98.00152	53.70923	8.889947	7.407860	14.85227	15.14069

Source: Author's computation using E-views 7.1

As with the impulse responses, the variance decomposition based on the Cholesky factor can change dramatically if you alter the ordering of the variables in the VAR.

The result of the variance decomposition of CPI within a 10-period horizon indicates the level of shocks associated with the individual variables. From table 4.5 which is for CPI the results indicates that shocks to GDP has the highest impact on future changes in CPI (67.66%) followed by shocks to ER (55.19%). With respect to ER in table 4.6, the results show that shocks to exchange rate (ER) has the highest effect on future changes in ER (82.28%), followed by those of GDP (53.71%).

5.1 Conclusion and Recommendations

This study assessed the possibility of the Nigerian economy to join the vast majority in adopting inflation targeting as a monetary policy strategy to achieve low inflation as well as maintain relative stability in prices. Specifically this study x-rayed whether this policy is worthwhile for the Nigerian economy given the prevalent conditions attached in adopting this monetary policy framework and empirically reviewed the most effective transmission mechanism channels through which this monetary policy framework will impact the economy. From the findings among the variables, it was only the exchange rate that gives a remarkable impact on CPI in terms of innovations, this strength exhibited by exchange rate can harnessed as a means of checking inflation thereby kick starting one of the inflation targeting instruments in Nigeria.

The research also found out that the exchange rate is face with the problem of exchange rate pass-through in Nigeria, because of the level import tendencies in economy. This implies that inflation in other countries are imported into the country through high demand import of goods and service by many Nigerians. Therefore, the paper recommends that government should use exchange rate as inflation targeting instrument in Nigeria to reduce the level of imported inflation for economic growth in Nigeria.

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