Impact of Open Market Operations and Money Supply on Inflation in Nigeria

Adedayo Oluwaseyi Adelowokan¹, Bolaji Adesola Adesoye², Titilope Maria Ogunmuyiwa³

Abstract: The results of monetary policy outcomes suggest that Nigeria does not often enjoy ideal conditions to adopting a monetary policy regime aimed primarily at stabilizing prices due to increasing internal debt resulting from sales of government securities. This has also push-up the volume of money supplied into her economy. This has made the economy particularly exposed to price and quantity-type external shocks, which renders price stabilization all the more complicated. This study examines the impact of open market operations and money supply on inflation rate in Nigeria within the period of 1981-2016. Using the vector error correction model approach, the result revealed that Treasury bill, government bonds, and money supply have positive and significant relationship with inflation rate in Nigeria. However, total value of money market instruments, income per capita and interest rate had negative and significant impact on inflation rate in Nigeria. The study concluded that open market operations while controlling the supply of money had significantly impacted on price stability in the long-run in the Nigerian economy. The study suggests that there is need for an increase use in the open market operations as a tool for achieving stability of price in the country.

Keywords: Treasury bill; government bonds; interest; income; inflation rate

JEL Classification: E31; E51; E52; O43

1. Introduction

The goals of indirect monetary policy in the developing countries like Nigeria are usually to contribute to the stability of overall output growth, achieve and maintain low unemployment, and maintain predictable exchange rates with other currencies. Apart from the stated objectives, the policies are adopted to stabilize prices, control money supply and monitor credit creation by financial institution. In Nigeria, the

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outcomes of the indirect monetary tools suggest that Nigeria does not often enjoy ideal conditions to adopting a monetary policy regime aimed primarily at achieving the objectives. One of the reasons is that the Nigerian macroeconomics environment often faces a very volatile macroeconomic environment and a more acute inflation-output trade-off than other emerging market economies which have embraced price stabilization programs (Alimi and Alese, 2017). Moreover, it could often be observed that the apex bank adopted different mix of indirect tools to stabilize price and control the supply of money in circulation. The use of these policy instruments has exposed the country to price and quantity-type shocks, which renders price stabilization to be more complicated. Thus, given the above, the problems associated with the use of indirect monetary policy tools owing to its objective of maintaining stability are inflation and money supply.

As emphasized in Favero and Giavazzi (2003), large and variable term premia and credit risks reinforce the possibility that a vicious circle might arise, making the fiscal constraint on monetary policy more stringent. Given these conditions, it is reasonable to expect that aiming for and adopting stable prices in the long run in Nigeria may not lead to successful outcomes. If the apex bank is unable to achieve her aims to stabilise price, it does implies that the credibility of the institution is at stake. Sims (2003) emphasized that when conditions are such that an inflation targeting commitment has a high probability of proving unsustainable, likewise, the necessary fiscal backup to monetary policy is not available, embracing explicit inflation targets can be unproductive or lead to an initial success that only amplifies a later failure.

Furthermore, one of the requirements for joining the Economic Community of West African States (ECOWAS) common currency zone is a single-digit rate of inflation. Unfortunately, inflation has persistently remained above a single-digit mark in Nigeria. The Central Bank of Nigeria has made inflation fighting one of the key objectives of the monetary policy framework. Despite the apex bank’s position on inflation, it has in many cases failed to attain the end of year targeted rate of inflation. The question begging to be asked then is “why has the Nigerian inflation persistently remained above the policy target?” This study sheds light on this question by providing robust evidence on the determinants of inflation in Nigeria from both the open market operations and total money supply into the economy. Thus, this study finds out the impact of open market operations and money supply on price instability in Nigeria. The study covers a period of 36 years; 1981-2016.

Other parts of the study are divided into four sections. The second section provides the review of previous studies while the methodology is discussed in section three. The fourth section presents results and discussion of findings, and the last section provides the concluding part.
2. Literature Review

Some of the major theories explaining the behaviour of inflation and its determinants include the quantity theory of money, Keynesian demand pull theory, the monetary theory put forward by Milton Friedman, also are the Cost push theory and the rational expectation theory by Lucas, McCallum, Sargeant and Hansen. All of these theories in their individual piece made attempt to uncover the peculiar nature of inflation, which has been seen to be a persistent general rise in the price of goods and services, based on the tenets of their schools of thought. Keynes (1946) and his cohorts in their support for the demand pull inflation theory, opine that inflation is majorly caused by increase in aggregate demand, which is composed of investment, government expenditure and consumption. They explain this, using the concept of the inflationary gap; the excess of aggregate demand over aggregate supply. Keynes submitted that the larger the gap between aggregate demand and aggregate supply, the more rapid inflation is and to reduce inflationary tendencies in any economy, entails initiating policies that reduce those components of total demand. The monetary theorists on the other hand, favoured money matters as key factor influencing the behaviour of inflation in any economy. In Milton Friedman’s submission, only money matters, and monetary policy is potential in ensuring economic stabilization as against the fiscal policy, which is vehemently supported by the Demand Pull theory. According to the monetarists, money is the dominant but not elusive determinant of inflation in an economy.

Empirical studies conducted on the factor determinants of inflation in different countries, both developed and developing, including Nigeria are reviewed in this section. Komijani and Nazarian (2004) reviewed the pattern of velocity of money in Iran during the period 1968 to 1979. They pointed out that velocity displayed three general trends during the period. It was shown that velocity registered a decreasing trend from its initial amount of 5.7 in 1968 until 1979, which coincided with the Iraq war, during which it reached its lowest level of 1.47. The second period synchronized with the war era in which velocity maintained an almost linear trend of 1.47 to 1.42. The third period was the post-war era in which velocity experienced an upward trend, rising with a smooth slope of 1.48. They attributed the upward trend to technical efficiency of the payments system and steps taken by the country's capital market. Their study further indicated that the velocity of liquidity was unstable during the period.

Mehrotra and Slick (2009) investigate the monetary determinants of inflation in four Central and Eastern European member states, namely Czech Republic, Hungary, Poland and Slovakia by using the McCallum rule for money supply. The deviation of actual money growth from the rule is included in the estimation of Phillips curves for the four economies by Bayesian model averaging. They find that money provides information about price developments over a horizon of ten
quarters ahead, albeit the estimates are in most cases rather imprecise. Moreover, the effect of excessive monetary growth on inflation is mixed. It is positive for Poland and Slovakia, but negative for the Czech Republic and Hungary. Nevertheless, these results suggest that money does provide information about future inflation and that a McCallum rule could potentially be used in the future as an additional indicator of the monetary policy stance once the precision of the estimation improves with more data available.

Leao (2005) attempted to provide an alternative explanation to the pro-cyclical behavior of velocity by using data over the period 1982 to 2003. He distinguished between expenditures related to durable consumption, export and investment goods on the one hand (DGEI), and expenditures related to non-durable goods and services (NDGS) on the other. The result showed that money involved in expenditures related to NDGS because agents usually synchronize their expenditures on the former category the moment that liquid capital has become available. Following this, he explained the pro-cyclical behaviour of velocity in terms of the increasing share of the DGEI in total expenditures during expansions and decreasing during downturns. The finding of Leao (2005) was further confirmed by Barros et al. (2007). They used a VAR model to analyze the determinants of the velocity of both M1 and M2 in the USA during the period 1964 to 2005 and found evidence in support of expenditure composition hypothesis. They showed that increases in the weight of investment and durable consumption in total expenditure raise the velocity of both narrow and broad money. As a result, they stressed that the more a central bank’s interest decision responds to money growth, the more volatile economic growth will be. In other words, a monetary policy which puts emphasis on money growth is de-stabilising.

Akhtaruzzaman (2008) investigated the income velocity of money for Bangladesh using data for the period 1973–2007. Based on co-integration analysis, he found that the velocity for both M1 and M2 was negatively related to real GDP (growth) and financial development (demand deposit – time deposit ratio) reflecting the early stages of economic and financial development in the country; and that the two variables jointly account for about half of the variance of the speed of income velocity.

Using Libyan annual data for the period 1964–2010, Cevik and Teksoz (2013) adopted the cointegration and error correction models to investigate inflation dynamics. The study found inflation inertia to be a key determinant of consumer price inflation in Libya. The result also indicated that government spending, money supply growth, global inflation, exchange rate pass-through and imposition and subsequent removal of international sanctions played central roles in the Libyan inflation process. Kabundi (2012) employed single-equation error correction model based on the quantity theory of money to identify the main factors underlying
inflation in Uganda. The study showed that both external and domestic factors affect inflation in Uganda, amongst which are money growth, world food prices, domestic supply and demand effects in the agricultural sector, energy prices and inflation inertia.

For Nigerian studies, Odusanya and Atanda (2010) analyzed the dynamic and simultaneous inter-relationship between inflation and its determinants for the period 1970 and 2007. They adopted cointegration and error correction modeling to analyze the role of variables like GDP growth, broad money growth, fiscal deficit/GDP ratio, interest rate, import/GDP ratio, exchange rate and inflation inertia; in inflationary process in Nigeria. The data indicated that only GDP growth and inflation inertia were significant in explaining the inflationary process in Nigeria. The paper estimated 0.39 as the degree of inflation inertia. Furthermore, Imimole and Enoma (2011) examine the impact of exchange rate depreciation on inflation in Nigeria. Their study utilized Autoregressive Distributed Lag (ARDL) bounds test cointegration procedure and annual time series data for the period 1986 to 2008. Their result revealed that inflation inertia was 0.69; while exchange rate depreciation, money supply and real GDP were identified as the main determinants of inflation in Nigeria.

Olatunji et al. (2010) also look at the factors affecting inflation in Nigeria using cointegration and error correction modeling. The authors indicated that exports, imports, consumer price index for food, interest rate and exchange rate were important in explaining the inflationary process in Nigeria. Bayo (2011) investigated the determinants of inflation in Nigeria between 1981 and 2003 using the ordinary least square estimation procedure. The study indicated that fiscal deficits, money supply, interest and exchange rates significantly impacted on the rate of inflation in Nigeria. Omotosho and Doguwa (2012) indicated that periods of high inflation volatility were associated with periods of specific government policy changes, shocks to food prices and lack of coordination between monetary and fiscal policies. They added that the announcement of fuel price hikes, announcement of an upward review in the wages of public sector workers, food crises and exchange rate instability also led to major positive inflationary shocks in the economy.

In a study by Akinlo (2012) on financial development and income velocity in Nigeria; using co-integration and error correction mechanism, the result showed a positive relationship between velocity and income growth which suggests that Nigeria might possibly be at later stages of economic growth. However, exchange rate has a negative relationship with income velocity in the short run model. The opportunity cost variables namely interest rate and expected rate of inflation were not significant in the short run model, thus conclusive inference cannot be drawn from them. This positive effect of financial development variable (demand deposit-
time deposit ratio) possibly arises from the fact that financial innovation encourages the use of money substitutes or quasi-money that reduces the demand for money and, thus, brings the speed of velocity of money up. The author, therefore, concluded that any attempt by government or monetary authorities in the country to exercise greater command over resources by printing more money would precipitate inflationary pressure.

3. Model Specification and Estimation Strategy

3.1 Model Specification and Theoretical Expectation

This study adopts the model of Adam et al. (2010) and Akinlo (2012) to examine the impact of open market operation and money supply on inflation. Following the theoretical submission of the monetary theory of inflation, open market operations variables measured by the total value of money market instruments is incorporated into the model, which becomes:

\[ p = f(ms, omo, y, i) \]  

Where: \( p \) is price; \( ms \) represents money supply; \( omo \) is open market operation measured by money market instruments; \( y \) represents real income per capita; and \( i \) refers to the cost of holding cash and it represents interest.

Log-linearising equation (1), the model becomes a static long run model for monetary determinants of inflation in Nigeria. Equation (2) is the key reference model for the empirical section of the study.

\[ \ln p = \alpha_0 + \alpha_1 \ln ms + \alpha_2 \ln omo + \alpha_3 \ln y + \alpha_4 \ln i + \mu, \]  

Where: \( p \) is price; \( ms \) represents money supply; \( omo \) is open market operation measured by money market instruments; \( y \) represents real income per capita; \( i \) is interest rate; \( t \) is time; \( \alpha_0, \alpha_{1-4} \) are parameters; \( \mu \) is error term.

The study also considers individual money market instrument based on data availability. The two instruments considered are Treasury bills and government bonds. Equation (2) becomes:

\[ \ln p = \beta_0 + \beta_1 \ln ms + \beta_2 \ln tr + \beta_3 \ln gb + \beta_4 \ln y + \beta_5 \ln i + \varepsilon, \]  

Where: \( p \) is price; \( ms \) represents money supply; \( tr \) is treasury bills; \( gb \) is government bonds; \( y \) represents real income per capita; \( i \) is interest rate; \( t \) is time; \( \beta_0, \beta_{1-4} \) are parameters; and \( \varepsilon \) is error term.

The study expects positive relationship between money supply and inflation rate. Specifically, an increase in money supply without corresponding increase in supply
of goods and services will lead to an increase in price. Similarly, economic theory postulates a positive relationship between inflation and interest rate. The inflation rate is expected to be low when high volume of the government securities are sold by the government. The rate of inflation is expected to be negatively correlated with the level of real income, it is therefore expected that the coefficient on income be negative. An increase in real income leads to an increase in real money demand and via Equation (2 & 3) results in a fall in the price of non-tradables and given the price of tradables, the general price level falls. In this paper we use the real GDP as a proxy for real income.

3.2 Estimation Techniques and Procedures

Before estimating the model, it is necessary to examine the statistical characteristics of the variables included in the function in order to verify their stationarity. The test of stationary on the variables would be done using the Augmented Dickey-Fuller (ADF) test ((Dickey and Fuller, 1979) in order to detect the presence of the unit root in the series and to determine the order of integration of the variables.

The cointegration technique makes it possible to test the existence of a relationship of long term equilibrium relationship among non-stationary economic variables. The multivariable system cointegration test developed by Johansen (1988) was employed in this study. The technique used the maximum likelihood estimator to determine the coefficients, the number and the significance of the cointegration vectors in the series (Alimi, Alese, and Yinusa, 2015; Adesoye, Adelowokan and Alimi, 2018).

In order to capture the short-run deviations that might have occurred in estimating the long-run cointegrating equations, a dynamic vector error correction model (VECM) is formulated. The error correction term depicts the speed of adjustment to equilibrium once the equation is shocked. The study also conducted diagnostic tests such as serial correlation, normality, functional form and heteroskedasticity tests.

3.3 Data Requirements and Sources

This research work uses annual time series data for the period of 36 years (1981-2016). The study uses secondary data published by the Central Bank of Nigeria (CBN) statistical bulletin, volume 29, 2018, while real income per capita and inflation data were sourced from World Development Indicators (WDI), 2018.
4. Data Analysis and Discussion

4.1. Descriptive Statistics

Table 1 presents the descriptive analysis of the time series properties of the variables included in the model. The descriptive statistics was carried out between open market operation, money supply and price stability in Nigeria from 1981 to 2016.

The table shows that the mean value of Treasury bill volume (TBV), government bonds (GB), total value of money market instruments (OMO), money supply (MS), inflation rate (P), real per capita income (Y) and interest rate (I) stood at \( \text{₦695.10 billion}, \ \text{₦78.06 billion}, \ \text{₦3433.12 billion}, \ \text{₦4,172.19}, \ 19.6\% \), \( \text{₦139,491.7} \) and \( 19.6\% \) respectively. The standard deviation of Treasury bill volume (TBV), government bonds (GB), total value of money market instruments (OMO), money supply (MS), inflation rate (P), real per capita income (Y) and interest rate (I) from their respective long term mean values every year point at \( \text{₦925.66 billion}, \ \text{₦170.21 billion}, \ \text{₦8747.4 billion}, \ \text{₦6,363.75}, \ 17.69\% \), \( \text{₦177,847.8 billion} \) and \( 17.69\% \) correspondingly. The probability values of all the variables show their distribution level at mean zero and constant variance. This reveals that these variables are not normally distributed among all the variables of interest.

4.2. Unit Root Test Results

Table 2 presents the results of the time series properties of the variables included in the model. This pre-test was carried out before estimating the long-run and short-run relationship among open market operation, money supply and price stability in Nigeria (1981-2016). The Augmented Dickey Fuller (ADF) unit root test results is
presented in Table 2 indicate that Treasury bill volume (TBV), government bonds (GB), total value of money market instruments (OMO), money supply (MS), inflation rate (P), real per capita income (Y) and interest rate (I) were reported to be stationary at first difference [I(1)]. Thus, these series are non-mean reverting at levels and do not converge to their long-run equilibrium until they are first differenced.

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF Tau Statistics</th>
<th>Order of Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept Linear Trend</td>
<td></td>
</tr>
<tr>
<td>TB</td>
<td>-4.8935 (0) [-3.6494]*</td>
<td>-4.8269 (0) [-4.2529]*</td>
</tr>
<tr>
<td>GB</td>
<td>-7.3323 (0) [-3.6394]*</td>
<td>-7.7345 (0) [-4.2529]*</td>
</tr>
<tr>
<td>OMO</td>
<td>-6.4813 (0) [-3.6394]*</td>
<td>-6.7370 (0) [-4.2529]*</td>
</tr>
<tr>
<td>Y</td>
<td>-3.0774 (1) [-2.9511]**</td>
<td>-3.5549 (0) [-3.5485]**</td>
</tr>
<tr>
<td>I</td>
<td>-7.2004 (0) [-3.6394]*</td>
<td>-7.1469 (0) [-4.2529]*</td>
</tr>
<tr>
<td>P</td>
<td>-5.7671 (0) [-3.6394]*</td>
<td>-5.6834 (0) [-4.2588]*</td>
</tr>
<tr>
<td>MS</td>
<td>-3.2976 (0) [-2.9511]**</td>
<td>-3.2613 (0) [-3.2071]**</td>
</tr>
</tbody>
</table>

Note: * significant at 1%; ** significant at 5%; *** significant at 10% Mackinnon critical values and are shown in parenthesis. The lagged numbers shown in brackets are selected using the minimum Schwarz and Akaike Information criteria.

Source: Authors’ computation (2018).

4.3. Co-integration Test

A co-integration test was performed using the Johansen (1988) approach to find out the existence or inexistence of a long-run relationship among the variables employed for this study and the results are presented in Table 3. From the first equation, the table indicates that four (4) cointegrating equations since the Trace Statistics and Maximum Eigen value of the hypothesized number of co-integrating equations are greater that their critical values at 5% significance level respectively. For the second equation, the table indicates that two (2) cointegrating equations since the Trace Statistics and Maximum Eigen value of the hypothesized number of co-integrating equations are greater that their critical values at 5% significance level respectively. This implies long-run relationships between total value of money market instrument, money supply and inflation rate in Nigeria during the periods, 1981-2016. This indicates the appropriateness of the vector error correction model (VECM) estimation technique which captures both the long-run and short-run information.
### Table 3. Cointegration Rank Test Results

<table>
<thead>
<tr>
<th>Hypothesized CE(s)</th>
<th>No. of Variables: P TB GB MS Y I</th>
<th>Trace Statistic</th>
<th>Prob.**</th>
<th>Max-Eigen Statistics</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>180.2237</td>
<td>0.0000</td>
<td>63.87190</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>At most 1*</td>
<td>116.3518</td>
<td>0.0000</td>
<td>43.78502</td>
<td>0.0024</td>
<td></td>
</tr>
<tr>
<td>At most 2*</td>
<td>72.56678</td>
<td>0.0001</td>
<td>34.08857</td>
<td>0.0063</td>
<td></td>
</tr>
<tr>
<td>At most 3*</td>
<td>38.47822</td>
<td>0.0039</td>
<td>24.54097</td>
<td>0.0159</td>
<td></td>
</tr>
<tr>
<td>At most 4</td>
<td>13.93724</td>
<td>0.0847</td>
<td>9.170173</td>
<td>0.2723</td>
<td></td>
</tr>
<tr>
<td>At most 5*</td>
<td>4.767069</td>
<td>0.0290</td>
<td>4.767069</td>
<td>0.0290</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesized CE(s)</th>
<th>No. of Variables: P OMO MS Y I</th>
<th>Trace Statistic</th>
<th>Prob.**</th>
<th>Max-Eigen Statistics</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>87.72003</td>
<td>0.0010</td>
<td>35.44637</td>
<td>0.0322</td>
<td></td>
</tr>
<tr>
<td>At most 1*</td>
<td>52.27366</td>
<td>0.0182</td>
<td>30.34414</td>
<td>0.0215</td>
<td></td>
</tr>
<tr>
<td>At most 2</td>
<td>21.92952</td>
<td>0.3024</td>
<td>13.23299</td>
<td>0.4310</td>
<td></td>
</tr>
<tr>
<td>At most 3</td>
<td>8.696532</td>
<td>0.3942</td>
<td>8.687183</td>
<td>0.3131</td>
<td></td>
</tr>
<tr>
<td>At most 4</td>
<td>0.009349</td>
<td>0.9226</td>
<td>0.009349</td>
<td>0.9226</td>
<td></td>
</tr>
</tbody>
</table>

Note: *indicates 4 cointegrating equations at 5% level and rejection of the hypothesis at 5% level. **MacKinnon-Haug-Michelis (1999) p-values.

### Source:
Author’s Computation (2018).

#### 4.4. Vector Error Correction Estimates

#### 4.4.1. Impact of Treasury bill, Government Bonds and Money Supply on Inflation Rate

The short-run estimates of the relationship among treasury bills, government bonds, money supply and inflation rate from the VEC model are reported in Table 4, likewise, the long-run estimates. The lag length on all variables as the model was set at two to ensure sufficient degree of the freedom based on automatic selection of Schwarz Information Criterion (SIC). The coefficient of the short-run lag one of change in inflation has negative and significant impact on the current changes in inflation rate at 5%. This implies that the changes in inflation rate measuring price instability in the first period in the short-run dictate the current level of price in Nigeria. The short-run parameter estimates of treasury bills and income per capita were found to be negative indicating that they negatively influence changes in inflation rate in the short-run. The short-run coefficient of income per capita was...
statistically significant at 5%. However, the coefficients of government bonds, money supply and interest rate were positive implying that they directly influence changes in inflation in the short run. The coefficient of interest rate was statistically significant at 5%. The coefficient of the ECM is found to be negative and statistically significant at the conventional level. The ECM value (-0.4151) implied that the model corrects its short-run disequilibrium by 41.5% speed of adjustment in order to return to the long run equilibrium.

**Table 4. Short-Run Cointegrating Estimates**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆P(-1)</td>
<td>-0.539921</td>
<td>0.27983</td>
<td>-1.92946</td>
<td>0.0527</td>
</tr>
<tr>
<td>∆TB(-1)</td>
<td>-0.728564</td>
<td>0.61742</td>
<td>-1.18001</td>
<td>0.2542</td>
</tr>
<tr>
<td>∆GB(-1)</td>
<td>0.157805</td>
<td>0.11480</td>
<td>1.37461</td>
<td>0.1623</td>
</tr>
<tr>
<td>∆MS(-1)</td>
<td>0.627171</td>
<td>1.48730</td>
<td>0.42168</td>
<td>0.4837</td>
</tr>
<tr>
<td>∆Y(-1)</td>
<td>-2.302856</td>
<td>1.56762</td>
<td>-1.46901</td>
<td>0.0982</td>
</tr>
<tr>
<td>∆I(-1)</td>
<td>0.924467</td>
<td>0.51120</td>
<td>1.80842</td>
<td>0.0586</td>
</tr>
<tr>
<td>ECT(-1)</td>
<td>-0.415107</td>
<td>0.15655</td>
<td>-2.65162</td>
<td>0.0068</td>
</tr>
</tbody>
</table>

**Long-run Estimates**

| TB         | 2.004683    | 0.19898    | 10.0746     | 0.0000 |
| GB         | 0.126310    | 0.03949    | 3.19880     | 0.0072 |
| MS         | 0.581440    | 0.25194    | 2.30789     | 0.0197 |
| Y          | -2.600831   | 0.33140    | -7.84812    | 0.0000 |
| J          | 1.442819    | 0.30682    | -4.70252    | 0.0000 |
| Constant   | -7.857690   | 0.90991    | -8.63561    | 0.0000 |

R-squared 0.7587  F-stat 10.850*
Adj. R-squared 0.4713

Note: * denotes significance at 1%; ** denotes significance at 5%

Source: Author’s Computation (2018).

The long-run estimates from Table 4 indicated that change in inflation rate was positively affected by treasury bills, government bonds and money supply. The result shows that only money supply was in tandem with the theoretical expectations. On magnitude basis, 10% increase in treasury bills, government bonds and money supply; change in inflation rate increased by 20.05%, 1.26% and 5.81% respectively. Consequently, the table reported that income per capita and interest rate have indirect effects on change in price instability, where only the former conforms to a priori expectations. A 10% increase in income per capita and interest rate reduce change in inflation rate by 26.01% and 14.43% correspondingly. In terms of partial significance, all indicators were had significant effects on change in inflation rate in Nigeria during the reviewed periods.
The coefficient of determination (Adjusted-\(R^2\)) is moderate (47.13%) indicating that about 47.13% of the total variations in inflation rate was explained by the variables in the model. The overall test using the F-statistic (10.850) is statistically significant at 5% level of significance showing that model is well specified and statistically significant.

4.4.2. Impact of Total Value of Money Market Instruments, Money Supply on Price Instability

The shot-run and long-run estimates of the relationship between open market operation measured by total value of money market instruments, money supply and inflation from the VEC model are shown on Table 5. The lag length on all variables as the model was set at two to ensure sufficient degree of the freedom based on automatic selection of Schwarz Information Criterion (SIC). The coefficient of the short-run lag one of change in inflation has negative and significant impact on the current changes in inflation rate at 5%. This implied that the changes in inflation rate measuring price instability in the first period in the short-run dictate the current level of price in Nigeria. The short-run parameter estimates of the total value of money market instruments and income per capita were found to be negative indicating that they negatively influence changes in inflation rate in the short-run. The short-run coefficient of income per capita was statistically significant at 10%. However, the coefficients of money supply and interest rate were positive implying that they directly influence changes in inflation in the short run. The coefficient of the two variables was statistically insignificant at 5%. The coefficient of the ECM is found to be negative and statistically significant at the conventional level. The ECM value (-0.5235) implied that the model corrects its short-run disequilibrium by 52.4% speed of adjustment in order to return to the long run equilibrium.
The table reported that total value of money market instruments (OMO) and income per capita have indirect effects on change in price instability, where all conform to a priori expectations. A 10% increase in total value of money market instruments and income per capita reduce inflation rate by 2.16% and 6.19% correspondingly. The long-run estimates from Table 5 also indicated that change in inflation rate was positively affected by money supply and interest rate. The result shows that they were in tandem with the theoretical expectations. On magnitude basis, 10% increase in money supply and interest rate; inflation rate increases by 6.96% and 3.42% respectively. In terms of partial significance, all indicators were had significant effects on change in inflation rate in Nigeria during the reviewed periods. 

The coefficient of determination (Adjusted-R²) is moderate (44.75%) indicating that about 44.75% of the total variations in inflation rate was explained by the variables in the model. The overall test using the F-statistic (11.957) is statistically significant at 5% level of significance showing that model is well specified and statistically significant.

4.5. Discussion of Results

The findings show that treasury bills value, monetary policy rate and money supply have positive impact on inflation rate in Nigeria. This revealed that the action of the monetary committees to push monetary policy rate up coupled with increase in money supply lead to price instability in Nigeria. The coefficients of treasury bill
rate and income per capita were negative. It implies that high rate of treasury bill propel investors to buy more invariably reducing the volume of money supply in the economy, thus, reduce price instability. Also, increase in per capital income indicating that improvement in economic activities was reported to be responsible for decrease in inflation rate.

5. Conclusion and Policy Recommendation

This study examined the role of open market operation and money supply on price stability in the Nigerian economy between 1981 and 2016. The unit root test result indicated that all the indicators were reported to be stationary at first difference. The Johansen cointegration results show that all the indicators have equilibrium condition that keeps them together in the long-run. It implies that there is a long-run relationship between open market operations, money supply an inflation rate in Nigeria. The estimated VECM model results revealed that Treasury bill, government bonds, and money supply have positive and significant relationship with inflation rate in Nigeria. However, total value of money market instruments, income per capita and interest rate had negative and significant impact on inflation rate in Nigeria. Thus, there is need for an increase use in the open market operations as a tool for achieving stability of price in the country. Financial sector reforms by the monetary authority should be implemented accordingly with great care to avoid financial instability on other monetary variables such as exchange rate, interest rate and domestic credit.

6. References


