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An Empirical Analysis of the Determinants of Inflation in Nigeria

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Abstract
This paper investigates the determinants of inflation in Nigeria between 1980 and 2012. The properties of time series variables were examined through the use of OLS, Augmented Dickey-Fuller technique in testing the unit root property of the series and Granger causality test of causation between inflation and money supply, government expenditure, exchange rate, and interest rate, cointegration and vector error correction techniques was also employed. The results of unit root suggested that all the variables in the model are stationary. Inflation is stationary at level while money supply, government expenditure, exchange rate and interest rate are stationary at first difference. The results of Causality suggested causation between inflation and some of the included variables. The Johansen cointegration result shows that there existed long run relationship between inflation and the included variables. The VEC error correction result also confirmed the existence of long run relationship between the variables of the model with only money supply and exchange rate causing interest rate. The OLS results revealed that money supply and interest rate influenced inflation positively, while government expenditure and exchange rate influenced inflation negatively. Therefore, a good performance of the economy in terms of price stability may therefore, be achieved by reducing money supply and interest rate and also increasing government expenditure and exchange rate in the country. A major policy implication of this study is that concerted effort should be made by policy makers to stabilize prices (inflation) by reducing money supply and interest rate as well as increasing government expenditure and exchange rate; most importantly increasing exchange rate and reducing interest rate.
Key words: Inflation, effects, Error Correction Method, co-integration, money supply

1.0 INTRODUCTION

The emergence of substantial inflation figure in Africa and Nigeria in particular has led to widespread studies about its causes. Persistent price increases are among the most serious problems affecting every economic unit. That is why very country is saddle with the responsibility of ensuring stability in general price level as one of core macroeconomic objectives to achieve economic development.

The three major explanations of inflation include fiscal, monetary, and balance of payments aspects. Monetary aspect, inflation is considered to be due to an increase in money supply, in fiscal aspect, budget deficit are the fundamental causes of inflation. However, the fiscal aspect is closely linked to monetary explanations of inflation since government deficit are often financed by money creation in developing countries. In the balance of payment aspect, emphasis is placed on exchange rate. That is the collapse of exchange rate brings about inflation either through higher import prices and increase in inflationary expectation, which are often accommodated or through an accelerated wage indexation mechanism (Akinbobola, 2012)

However, efforts by various governments to curb inflationary tendencies, the problems and its effects continued unabated. Its causes are many, vary, and well captured in literature. Such studies are: Okpara and Nwaoha (2010), Fullerton and Ikhide (1998), Owoye (2007), Taiwo (2011) to mention but few. These studies reveals growth in money supply, government deficit financing, exchange rate decreased agricultural and industrial production among other were responsible for inflationary pressure in Nigeria. And the most significant effect of inflation is its impact on government revenues and non-performance of the economy. Inflation also makes budgeting and future planning difficult for economic agents imposes a drag on productivity, particularly when firms are forced to shift resources away from products and services, thereby discouraging investment and retarding growth (Orubu, 2009)

The high inflation rate has become a serious concern in the industrial and emerging market economies globally. Inflation constitutes one of the factors responsible for poverty, low standard of living and growth in Nigeria. Hence, the paper is to investigate into the root causes of inflation in Nigeria

2.0 THEORITICAL ISSUES AND LITERATURE REVIEW

Inflationary discourse still remains the most contentious Macroeconomic studies which have theoretical basis in the perspective of both the Monetarist and the Keynesian schools of thought. Most economist before Keynes had underscored the relationship between the amount of money supply and the level of general prices, however, with

varying degree of emphasis. The quantity theory of money states that the general price level changes in direct proportion to a change in the level of money supply.

Keynes (1936) posited that inflation is caused by a situation of excess aggregate demand over aggregate supply when there is no excess capacity, a situation in which the economy operates at full employment of resources. Furthermore, there are strong arguments that fiscal deficits are major cause of inflation. Abolo (1997) among other researchers contented that evidence points to fiscal deficits as major cause of inflation.

The argument that price inflation is significantly determined by the process mark-up on the costs of firm's production process has been advanced in the models of Goacher (1986) and Gordon (1984) believed that inflation could result from the cost of imported goods rising independently of the demand for them in the domestic economy.

Most recently, there is an emerging trends of literature on inflation came to be known as the political economy approach to macroeconomic policy Selialia (1995).These recent theories of inflation have shifted attention away from traditional direct economic causes of inflation, such as money creation, towards political and institutional determinants of inflationary pressures because being theoretical and put emphasis almost exclusively on industrial countries.

There are relatively large literature dealing with relations between monetary indicators and other macroeconomic variables. Doroshenko, (2001), consider relation between both money supply and inflation and between money supply and inflation and found a long-run relationship between between money growth and inflation. Clemens and Alex (2002) empirically estimate the relationship between exchange rate accommodation and the degree of inflation persistence using a non-linear autoregressive inflation equation for ten European countries for the period 1974-1998..Thier results provide supportive evidence for the existence of a positive link between exchange rate accommodation and inflation persistence for most of the smaller and more dependant exchange rate mechanism countries, even when mean level shift in inflation are appropriately accounted for.

Mahamadu and Philip (2003) explore the relationship between monetary growth, exchange rate, and inflation in Ghana using Error Correction Mechanism The result confirms the existence of a long run equilibrium relationship between inflation, money supply, exchange rate and real income. In line with theory, the finding demonstrates that in the long run, inflation in Ghana is positively related to the money supply and exchange rate and negatively related to real income.

In Nigeria, there have been several studies on causes on inflation. For instances Oyejide(1972), Akinnifesi (1984), Adeyeye and Fakiyesi (1980), Osakwe (1983), Asogwu(1991) to mention but few are attempts empirically to ascertain the cause of inflation in Nigeria. Oyejide(1972) made empirically enquiry into the impact of deficit financing on inflation and capital formation. He related domestic money supply to inflation using Fisher's type of equation. Since there seems to exist a direct correlation between general price level and measure of deficit financing over the 1957- 1970 time period, he concluded that less emphasis on deficit financing may limit the growth of price inflation.

Odusanya and Atanda (2010) analyzed the dynamics and simultaneous inter-relationship between inflation and its determinants in Nigeria between 1970 and 2007 examined using the Augmented Dickey Fuller (ADF) and unit root test. The result reveals that inflation rate, growth rate of real output, money supply and real share of fiscal deficit are stationary at levels, while, other incorporated variables-real share of import, exchange rate and interest rate are stationary at first difference. Adeyeye and Kola also examined the causes and effects of inflation in Nigeria between 1969 and 2009 and what could be done to ameliorate the negative effects on the economy. The time series variables properties on some selected variables were examined using ADF unit root test and co-integration analysis. The result reveals that money supply, growth rates, gross domestic product growth rate and expenditure revenue ratio are not spurious but exchange rate of dollar to Naira was non-stationary. The study also revealed that the GDP growth rate is counter inflationary as against inflationary factors. It is suffice to say that causes of inflation is one of the most highly treated subject in economic researches and literature. See OKpara and Nwoaha (2010),Fullerton and Ikhide (1998), Odusunya and Atanda (2010), Egwaikhide et al (1994), Jhingan (2004),Batini(2004),Owoye (2007), Asogu (1999) among others.

3.0 METHODOLOGY

Sources of data: The time series data were derived from various secondary sources such as: the Central bank of Nigeria statistical bulletins, Economic and Financial Review and Annual reports and statement of accounts and Federal Office of Statistics (FOS).Data were also extracted from Debt Management Office (DMO) publications and website. The macroeconomic data cover gross domestic product (GDP) and external debts between 1980-2011.The data gathered were subjected to various econometric tests with the aid of e-views.

The estimated techniques includes the Ordinary Least Square (OLS)method, Augmented Dickey- Fuller (ADF) unit root test, Johansen Co-integration test and Error Correction Method (ECM).The estimations follow three step modeling procedure.

i. Employing Augmented Dickey-Fuller Unit root test to make non-stationary variables stationary to overcome spurious results.
ii. After establishing stationary of the data, Johansen Co-integration test is applied to determine whether a long run relationship exist among the variables in question.
iii. When it is established that the variables are co-integrated, an over-parameterized model (ECM1) is developed which involves leading and logging of the variables after which parsimonious model (ECM2) is built in accommodate short-run dynamic in the model.

Model specification

The econometric form of the model is specified as: IFL =f(MS,GER,,EXR,INR) and the econometric equation is thus

IFL = $\alpha + b_1MS + b_2$ GEX $+b_3$ EXR + b_4IR + u_t,

Where: INF = Inflation rate, MS = Money supply, GEX = Government expenditure, EXR = Exchange rate, INR = Interest rate, u_t = Error term

α = Intercept of relationship in the model, b_1-b_4 = Coefficients of independent variables and the a priori for the coefficients in the model are $b_1, b_2 > 0$ and $b_3, b_4 < 0$.

The error correction model (ECM) is as follows:

$$\Delta \text{Log}INF_{t-1} = \alpha + \sum \text{Log}MS_{t-1} + \sum \text{Log}GER_{t-1} + \sum \text{Log}EXR_{t-1} + \sum \text{Log}INR_{t-1} + ECM_{t-1}$$

Where: ECM_{t-1} = Error Correction term, t-1 = Variable Lagged by one period.

4.0 Results and Discussion

Table 1: Regression results before log

Dependent Variable: INF
Method: Least Squares
Date: 06/22/13 Time: 18:17
Sample: 1980 2012
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.422371	9.827949	0.246478	0.8071
MS	7.76E-08	2.96E-07	0.262226	0.7951
GEX	-1.81E-07	7.50E-07	-0.242007	0.8105
EXR	-0.150468	0.078203	-1.924061	0.0646
IR	1.571901	0.551251	2.851518	0.0081

R-squared	0.308261	Mean dependent var	21.09394
Adjusted R-squared	0.209442	S.D. dependent var	18.74605
S.E. of regression	16.66774	Akaike info criterion	8.603555
Sum squared resid	7778.780	Schwarz criterion	8.830298
Log likelihood	-136.9587	Hannan-Quinn criter.	8.679847
F-statistic	3.119428	Durbin-Watson stat	1.459109
Prob(F-statistic)	0.030531		

Table 1 contains multiple regression results for inflation and its determinant before taking the natural log. The results indicate that the coefficient of MS, GEX, and the constant are found to be statistically insignificant at 79.51percent, 81.05percent, and 80.71percent level based on their probability values. The coefficient of EXR and IR are found to be statistically significant at 10percent, and 1percent level respectively as indicated by their probability values of 0.0646, and 0.0081 respectively. The coefficients of MS and EXR is rightly signed (positive and negative respectively) while the coefficients of GEX and IR are not rightly singed. Hence, is not consistence with theoretical expectation. This implies that 1unit change in MS (money supply) and 1percent change in IR (interest rate) raises INF (inflation rate) by 7.76E-08units and 1.571901percent respectively also 1unit change in GEX and 1percent change in EXR will reduce INF by 1.81E-07units and 0.150468percent respectively. The F-statistics value of 3.119, which measure the joint effects of the explanatory variables, was

significant at 5 per cent as indicated by the corresponding probability value 0.0305. This implies that the variables of the model are statistically significant.

The R^2 value of 0.3083 implies that 30.83 per cent of the total variation in inflation rate is explained by the variables defined by the regression equation. The goodness of fit of the regression remained low after adjusting for the degree of freedom as indicated by the adjusted R^2 (R^2 = 0.2094 or 20.94%). The Durbin-Watson statistics (1.4591) in table 1 is higher than R^2 (0.3083) indicating that the model is non-spurious. The Durbin-Watson statistics 1.4591 is very low and less than 2 indicating positive autocorrelation. This provides the bases for conducting unit root test.

Table 2 : Rgression Results After Taking LOG

Dependent Variable: LOGINF
Method: Least Squares
Date: 06/22/13 Time: 18:30
Sample: 1980 2012
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.857967	2.688175	-1.063163	0.2968
LOGMS	0.374114	0.182921	2.045225	0.0503
LOGGEX	-0.353912	0.182866	-1.935360	0.0631
LOGEXR	-0.286655	0.220290	-1.301261	0.2038
LOGIR	1.984279	0.541017	3.667686	0.0010

R-squared	0.387269	Mean dependent var	2.729912
Adjusted R-squared	0.299736	S.D. dependent var	0.781233
S.E. of regression	0.653749	Akaike info criterion	2.126542
Sum squared resid	11.96687	Schwarz criterion	2.353285
Log likelihood	-30.08794	Hannan-Quinn criter.	2.202834
F-statistic	4.424270	Durbin-Watson stat	1.417154
Prob(F-statistic)	0.006752		

Table 2 contains multiple regression results for inflation and its determinant after taking the natural log. The result revealed that the coefficient of LOGEXR and the constant are found to be statistically insignificant at 20.38percent, and 29.68percent level based on their probability values. The coefficient of LOGMS, LOGGEX and LOGIR are found to be statistically significant at 10 per cent, 10 per cent and 1 per cent level respectively as indicated by their probability values of 0.0503, 0.0631, and 0.001 respectively. The coefficients of LOGMS, and LOGEXR are rightly signed (positive, and negative respectively) while the coefficients of LOGGEX and LOGIR are not rightly singed. Hence, is not consistence with theoretical expectation. This implies that 1 per cent change in MS (money supply) and IR (interest rate) raises INF (inflation rate) by 0.3741 per cent and 1.9843per cent respectively while 1percent change in GEX and EXR will reduce INF by 0.3539per cent and 0.2867per cent respectively. The F-statistics value of 4.4242, was significant at 1 per cent as indicated by the corresponding probability value 0.0068. This implies that the variables of the model are jointly, statistically significant.

The R^2 value of 0.3873 indicates 38.73 per cent of the total variation in inflation rate is explained by the variables defined by the regression equation. The goodness of fit of the regression remained low after adjusting for the degree of freedom as indicated by the adjusted R^2 (R^2 = 0.2997 or 29.97%). The Durbin-Watson statistics (1.4172) in table 2 is higher than R^2 (0.3873) indicating that the model is non-spurious. The Durbin-Watson statistics 1.4172 is very low and less than 2 indicating the presence of/or positive autocorrelation. This further confirms the need for conducting unit root test.

Table 3: Unit Root Test Result for Inflation

AT LEVEL
Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.424762	0.0174
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

Table 4: Unit Root Test Result for MS (Money Supply)

AT FIRST DIFFERENCE
Null Hypothesis: D(MS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.531386	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

Table 5: Unit Root Test Result for GEX (Government expenditure)

AT FIRST DIFFERENCE
Null Hypothesis: D(GEX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.765186	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

Table 6: Unit Root Test Result for EXR (Exchange Rate)

AT FIRST DIFFERENCE
Null Hypothesis: D(EXR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.445982	0.0014
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

Table 7: Unit Root Test Result for IR (Interest Rate)

AT FIRST DIFFERENCE
Null Hypothesis: D(IR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.695317	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

The results of unit root test in tables 3, 4. 5, 6, 7 and 8, revealed that INF is stationary at level (d(0) and at 5 and 10 per cent level. While MS, GEX, EXR and IR are stationary at first difference (d(1)); precisely at both 1 per cent ,5 per cent and 10 per cent level. INF is stationary at level and at 5 per cent and 10percent which is indicated by ADF results in table 3 at 5 per cent and 10 per cent less than the critical values in negative direction. The ADF value for INF is -3.4248 and the critical values are -3.6537, -2.9571 and -2.6174 at 1, 5, and 10 per cent respectively; the probability value also confirmed that INF is stationary at 5 per cent as indicated by its value of 0.0174. MS is stationary at first difference and at 1 per cent, 5 per cent and 10 per cent, which is indicated by ADF results in table 4 at 1 per cent, 5 per cent and 10 per cent less than the critical values in negative direction. The ADF value for MS is -7.5314 and the critical values are -3.6617, -2.9604, and -2.6192 at 1, 5, and 10 per cent respectively; the probability value also confirmed that MS is stationary at 1 per cent as indicated by its value of 0.0000. GEX is stationary at first difference and at 1 per cent, 5 per cent and 10 per cent, which is indicated by ADF results in table 5 at 1 per cent, 5 per cent and 10 per cent less than the critical values in negative direction. The ADF value for GEX is -6.7652 and the critical values are -3.6617, -2.9604, and -2.6192 at 1, 5, and 10 per cent respectively; the probability value also confirmed that GEX is stationary at 1 per cent as indicated by its value of 0.0000.

EXR is stationary at first difference and at 1 per cent, 5 per cent and 10 per cent, which is indicated by ADF results in table 5 at 1 per cent, 5 per cent and 10 per cent less than the critical values in negative direction. The ADF value for EXR is -4.446 and the critical values are -3.6617, -2.9604, and -2.6192 at 1, 5, and 10 per cent respectively; the probability value also confirmed that GEX is stationary at 1 per cent as indicated by its value of 0.0014.

IR is stationary at first difference and at 1 per cent, 5 per cent and 10 per cent, which is indicated by ADF results in table 5 at 1 per cent, 5 per cent and 10 per cent less than the critical values in negative direction. The ADF value for IR is -7.6953 and the critical values are -3.6617, -2.9604, and -2.6192 at 1, 5, and 10 per cent respectively; the probability value also confirmed that IR is stationary at 1 per cent as indicated by its value of 0.0000.

Table 8: Granger Causality test

Pairwise Granger Causality Tests
Date: 06/23/13 Time: 09:06
Sample: 1980 2012
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
MS does not Granger Cause INF	32	0.85035	0.3641
INF does not Granger Cause MS		3.04110	0.0918
GEX does not Granger Cause INF	32	0.82414	0.3715
INF does not Granger Cause GEX		0.91720	0.3461
EXR does not Granger Cause INF	32	0.64234	0.4294
INF does not Granger Cause EXR		0.80696	0.3764
IR does not Granger Cause INF	32	0.34359	0.5623
INF does not Granger Cause IR		0.07673	0.7837
GEX does not Granger Cause MS	32	7.80849	0.0091
MS does not Granger Cause GEX		3.35200	0.0774
EXR does not Granger Cause MS	32	4.61178	0.0402
MS does not Granger Cause EXR		0.00427	0.9483
IR does not Granger Cause MS	32	1.55687	0.2221
MS does not Granger Cause IR		0.48045	0.4937
EXR does not Granger Cause GEX	32	1.06905	0.3097
GEX does not Granger Cause EXR		0.65682	0.4243
IR does not Granger Cause GEX	32	0.17661	0.6774
GEX does not Granger Cause IR		0.27267	0.6055
IR does not Granger Cause EXR	32	0.25346	0.6185
EXR does not Granger Cause IR		1.12763	0.2970

The results of causality are contained in table 8. The results revealed that inflation granger cause MS, the null hypotheses are rejected at 10percent as indicated by its probability value of 0.0918. MS does not granger cause INF, the null hypotheses are accepted at 36.41per cent as indicated by its probability value of 0.3641, this is confirmed by their F-statistics values of 3.0411 and 0.8504 respectively. The results further revealed no causation between GEX and INF, EXR and INF, IR and INF, because their F-statistics values are less than 2. The result also revealed a bi-directional causation between GEX and MS. The null hypotheses are rejected at 1 per cent and 10 per cent respectively, as indicated by their probability values of 0.0091 and 0.0774 respectively. This is confirmed by their F-statistics value of 7.8085 and 3.352 respectively. The result further revealed a one-way causation between EXR and MS. The causation runs from EXR to MS. EXR granger cause MS, the null hypothesis is rejected at 5 per cent as indicated by its probability value of 0.0402, and this is also confirmed by its F-statistics value of 4.6118. The results also revealed no causation between IR and MS, EXR and GEX, IR and GEX, and IR and EXR because their F-statistics values are less than 2. This provide the basis to conducting cointegration test in order to find out whether there exist a long run relationship between the included variables in order consideration in Nigeria.

Table 9: Johansen Cointegration Test

Date: 06/23/13 Time: 09:17
Sample (adjusted): 1982 2012
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: INF MS GEX EXR 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 *	0.734422	89.91546	69.81889	0.0006
At most 1 *	0.589814	48.81423	47.85613	0.0405
At most 2	0.338233	21.18872	29.79707	0.3460
At most 3	0.231457	8.390626	15.49471	0.4246
At most 4	0.007380	0.229618	3.841466	0.6318

Trace test indicates 2 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 *	0.734422	41.10123	33.87687	0.0058
At most 1 *	0.589814	27.62551	27.58434	0.0494
At most 2	0.338233	12.79809	21.13162	0.4710
At most 3	0.231457	8.161007	14.26460	0.3626
At most 4	0.007380	0.229618	3.841466	0.6318

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Johansen cointegration test results contain in table 9 confirm the existence of long run relationship between inflation and the included variables in Nigeria as indicated by the TRACE-statistic and Max-Eigen Statistics. The TRACE-statistics results revealed that there is 2 cointegrating equation at 5percent level as indicated by its critical value of 29.7971 which is greater than the TRACE statistics of 21.1887; this is further supported by its high probability value of 0.3460.. This is also confirmed by the Max-Eigen statistics in table 10. The null of at most two cointegrating equations existed was accepted at 5 per cent level as indicated by its critical value of 21.1316 which is greater than the Max-Eigen statistics of 12.7981; this is further supported by its high probability value of 0.4710.

The vector error correction (VEC) result is contained in table 1 in appendix. The results revealed the existence of long run relationship between inflation and the included variables of the model after correcting the error of the estimates. The results further revealed that, there is one-way causation between MS and IR, but its runs from MS to IR, implying that MS granger causes IR, but IR does not granger causes MS. One-way causation was also revealed between EXR and IR, but flows from EXR to IR. This implied that both MS and EXR granger cause IR. R-Square still remain too low. R-square value of (0.2399) shows that only 23.99% variation in inflation was explained by the included variables. R-square adjusted coincidentally, became negative (-0.1022). This implied that the goodness of fit of the model is very low. The F-statistics of 0.7013 shows that all the included variables became insignificant after correcting the error in the estimated equations.

5.0 Conclusion and Remark

This paper investigates the determinants of inflation in Nigeria. The properties of time series variables were examined through the application of Augmented Dickey-Fuller technique in testing the unit root property of the series and Granger causality test of causation between inflation and money supply, government expenditure, exchange rate, and interest rate. The results of unit root suggest that all the variables in the model are stationary. Inflation is stationary at level while money supply, government expenditure, exchange rate, and interest rate are stationary at first difference. The results of Causality suggested that inflation granger cause money supply, but money supply does not granger cause inflation, no causation between government expenditure and inflation, exchange rate and inflation, interest rate and inflation, a one-way causation between exchange rate and money supply. The causation runs from exchange rate to money supply. Exchange rate granger cause money supply, the results also revealed no causation between interest rate and money supply, exchange rate and government expenditure, interest rate and government expenditure, and interest rate and exchange rate. The Johansen cointegration result shows that despite no causation between some variables of the study, but there existed 2 cointegrating equation, implying the existence of long run relationship between inflation and the included variables. The VEC error correction result also confirmed the existence of long run relationship between the variables of the model with only money supply and exchange rate causing interest rate. The results also revealed that money supply and IR determine inflation positively, while government expenditure and exchange rate determine inflation negatively. The result also shows that money supply and government expenditure does not significantly determine inflation rate in Nigeria, while exchange rate and interest rate are significantly determining inflation rate in Nigeria, therefore, a good performance of the economy in terms of price stability may therefore, be achieved by reducing money supply and interest rate and also increasing government expenditure and exchange rate in the country. A major policy implication of this study is that concerted effort should be made by policy makers to stabilize prices (inflation) by reducing money supply and interest rate as well as increasing government expenditure and exchange rate; most importantly increasing exchange rate and reducing interest rate.

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Appendix

Table 1 Vector Error Correction Estimates

Sample (adjusted): 1983 2012
Included observations: 30 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
MS(-1)	1.000000
GEX(-1)	-1.109179 (0.14256) [-7.78064]
EXR(-1)	-0.059091 (0.16588) [-0.35623]
IR(-1)	2.301962 (0.35722) [6.44418]
C	-6.710137

Error Correction:	D(MS)	D(GEX)	D(EXR)	D(IR)
CointEq1	-0.403964 (0.39643) [-1.01900]	0.186204 (0.18856) [0.98752]	-0.189500 (0.14931) [-1.26914]	-0.335029 (0.10732) [-3.12191]
D(MS(-1))	-0.111442 (0.40786) [-0.27324]	-0.096336 (0.19399) [-0.49659]	0.210149 (0.15362) [1.36800]	0.298829 (0.11041) [2.70657]
D(MS(-2))	0.011242 (0.32400) [0.03470]	0.034395 (0.15411) [0.22319]	0.241317 (0.12203) [1.97750]	0.202312 (0.08771) [2.30667]
D(GEX(-1))	-0.469621 (0.51384) [-0.91395]	-0.078207 (0.24440) [-0.31999]	-0.044874 (0.19353) [-0.23187]	-0.206820 (0.13910) [-1.48687]

D(GEX(-2))	0.513233	0.046568	0.233841	0.237840
	(0.69051)	(0.32843)	(0.26008)	(0.18692)
	[0.74327]	[0.14179]	[0.89912]	[1.27239]
D(EXR(-1))	-0.199077	-0.080563	0.322839	0.339378
	(0.53689)	(0.25536)	(0.20222)	(0.14534)
	[-0.37080]	[-0.31548]	[1.59650]	[2.33510]
D(EXR(-2))	0.207055	0.151578	0.252269	-0.052280
	(0.59299)	(0.28205)	(0.22335)	(0.16052)
	[0.34917]	[0.53742]	[1.12950]	[-0.32568]
D(IR(-1))	0.404768	-0.427590	-0.379136	-0.059691
	(0.78650)	(0.37409)	(0.29623)	(0.21291)
	[0.51464]	[-1.14301]	[-1.27986]	[-0.28036]
D(IR(-2))	0.054373	-0.311031	0.122465	0.003372
	(0.73527)	(0.34973)	(0.27694)	(0.19904)
	[0.07395]	[-0.88936]	[0.44221]	[0.01694]
C	0.196512	0.279281	-0.041895	-0.120963
	(0.30859)	(0.14678)	(0.11623)	(0.08354)
	[0.63681]	[1.90277]	[-0.36046]	[-1.44803]
R-squared	0.239873	0.206688	0.402425	0.543091
Adj. R-squared	-0.102183	-0.150302	0.133516	0.337482
Sum sq. resids	11.02496	2.494212	1.564025	0.807921
S.E. equation	0.742461	0.353144	0.279645	0.200988
F-statistic	0.701268	0.578974	1.496509	2.641381
Log likelihood	-27.55262	-5.259788	1.740867	11.64917
Akaike AIC	2.503508	1.017319	0.550609	-0.109944
Schwarz SC	2.970574	1.484385	1.017675	0.357121
Mean dependent	0.176508	0.247894	0.182164	0.025297
S.D. dependent	0.707207	0.329265	0.300418	0.246928

Determinant resid covariance (dof adj.)	8.19E-05
Determinant resid covariance	1.62E-05
Log likelihood	-4.790011
Akaike information criterion	3.252667
Schwarz criterion	5.307757