# Analysis of Inflation and its Determinants in Nigeria

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**Abstract:** The study critically analyzed the dynamic and simultaneous inter-relationship between inflation and its determinants in Nigeria between 1970 and 2007. The time series variables properties were examined using the Augmented Dickey Fuller (ADF) unit root test and the result reveals that inflation rate, growth rate of real output and money supply and real share of Fiscal deficit are stationary at levels while other incorporated variables in the empirical analysis; real share of Import, Exchange rate and Interest rate are stationary at first difference. The long-run and short-run mechanism of interaction between inflation and its determinants were examined usig the Augmented Engle-Granger (AEG) cointegration test and Error Correction Mechanism (ECM) model, respectively.

**Key words:** Inflation, determinants, unit root, cointegration, error correction model, Nigeria economy

## INTRODUCTION

It is widely accepted that the pursuit of price stability is primary to long-run growth and development and should be concern of every economy. One of the reasons for this is the high varying inflation rate which has social and economic shocks on the economy as a result of its negative effect on price stability, savings and investment. Given this scenario, the focus of monetary policy is primarily to be narrowed to the pursuit of low inflation rather than output or unemployment.

Inflation does not happen out of a clear sky blue. It serves some political purpose. In a bid to curb inflation, it is useful to try to understand what purpose its continuation serves. Burton and Fisher presumes that government inflate the economy in return for some perceived real benefits. And even though, money may be neutral in the long run, it may have powerful short run effect. An illustration of this is the statement credit to Lenin who was reported to say; the best way to destroy the capitalist system is to debauch the currency. By a continuing process of inflation, government can confiscate, secretly and unobservedly an important part of the wealth of their citizens.

In Nigeria, there have been several studies for various time period on the cause of inflation. For instance, Oyejide (1972), Akinnifesi (1984), Adeyeye and Fakiyesi (1980), Osakwe (1983) and Asogu (1991), attempted empirically to ascertain the cause of inflation in Nigeria. Oyejide (1972) made empirical enquiry into the impact of

deficit financing on inflation and capital formation. He related domestic money supply to inflation using Fishers 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.

According to Akinnifesi (1984), factors such as changes in money supply, lagged changes in money supply, credit to government by the banking system, government deficit expenditure, industrial production and food price indices were variable captured while changes in the annual data for 1960-1983 were used in empirical estimation. The study showed that changes in the above factors, jointly explained inflationary tendencies in Nigeria.

The study however, emphasized that the increase in government expenditure financed by monetization of oil revenue and credit from the banking system were responsible for the expansion of money supply which in turn with a lagged-in-effect contributed immensely to inflationary tendencies.

A study conducted in research department of Central Bank of Nigeria (CBN) for the period of 1960-1994, confirmed that growth in the money supply is the determinant of inflation in Nigeria.

In the periods of high monetary growth (1988, 1990, 1992-1994), inflation surged accordingly, though with some lag. As the increase in Narrow money rose from

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4.1% in 1988, the inflation rate increased from 5.4-38.3% during the same period. Following the lag response of inflation to monetary growth, inflation peaked at 50.0% in 1989.

Similarly, when the money supply growth increased substantially, inflation also accelerated. On the other hand, the decline in the monetary growth rate in 1994 led to a consequent decline in inflation rate. This confirmed that there is a strong link between increases in money supply and inflation.

## MATERIALS AND METHODS

In order to determine the dynamic and simultaneous inter-relationship between inflation and its determinants, an empirical model used by Laryea and Sumaila (2001) is adopted and modified to achieve the objectives of the study. The adopted model is specified as:

$$INF_t = \beta_0 + \beta_1 GRGDP_t + \beta_2 GRM_t + \beta_3 FDGDP_t + \beta_4 MGDP_t + \beta_5 INF_{t-1} + \beta_6 EXR_{t-1} + u_t$$

The adopted Laryea and Sumaila (2001) model is modified with the inclusion of interest rate based on the assumption that at higher interest rate (lending), potential investors are discouraged leading to Investment Crowd Out effect. Deterrioting investment level will cause increase in price of commodities with resultant inflationary pressure on the economy. Thus, for this study the empirical model is specified as:

$$INF_t = \phi_0 + \phi_1 GRGDP_t + \phi_2 GRM_t + \phi_3 FDGDP_t + \phi_4 MGDP_t + \phi_5 INF_{t-1} + \phi_6 EXR_{t-1} + \phi_7 INT_t + u_t$$

where the time series variables INF, GRGDP, GRM, FDGDP, MGDP, $INF_{t-1}$, EXR and INT represent Inflation rate, Growth rate of Gross Domestic Product (GDP), Growth rate of Money supply (M2), Fiscal deficit as percentage of GDP, Import as a percentage of GDP, first lagged of inflation, Exchange rate (U.S dollar to naira) and interest rate, respectively. $\beta_0$ and $\phi_0$ is the intercept while $\beta_{1-6}$ and $\phi_{1-7}$ represent the co-efficient of the inflation determinants incorporated in the models and $\mu_t$ is the error term.

The time series data from 1970-2007 are sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin for several issues.

The time series properties of the variables are examined through the use of Augmented Dickey Fuller (ADF) unit root test, based on the following system of equations:

**Intercept:**

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{i=1}^{n} \phi_i \Delta Y_{t-i} + \omega_t$$

**Trend:**

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + \sum_{i=1}^{n} \phi_i \Delta Y_{t-i} + \omega_t$$

Where:
$\omega_t$ = The residual term
$Y_t$ = The time series variable

Also, the long-run relationship is established between inflation and its determinants using the Augmented Engle-Granger (AEG) cointegration test. Also, the short-run disequilibrium and dynamic interaction between inflation and its determinants as result of stochastic shock exerted on the long-run equilibrium is captured by the Error Correction Mechanism (ECM) model.

## RESULTS AND DISCUSSION

The stationary test result of the time series variables using the Augmented Dickey Fuller (ADF) unit root test approach is shown in Table 1. The results show that only Inflation rate (INF), Growth rate of GDP, Growth Rate of Money supply (GRM) and real share of Fiscal deficit (FDGDP) are found to reject the null hypothesis of no stationary at level and this implies that the time series variables are relatively stable and integrated of order zero. While other time series variables, real share of Import (MGDP), Exchange rate and Interest rate accept the null hypothesis of no stationary at levels and are differenced once to make them stationary. This implies that MGDP, EXR and INT data are not stable at levels but stable at first difference.

Since, the incorporated variables in this study are not of the same order of integration, we assume the same level of stability in the data distribution pattern i.e., the same order of integration for the subsequent tests. Otherwise, the long-run relationship would not be established excluding the short-run analysis which does not require the same order of integration.

Table 1: Unit root test results

| Variables | ADF Tau statistics | | Order |
|---|---|---|---|
| | Intercept | Trend | |
| INF | -3.430** (1) | -3.356*** (1) | 0 |
| GRGDP | -4.521* (1) | -4.486* (1) | 0 |
| GRM | -3.466** (1) | -3.692** (10) | 0 |
| FDGDP | -3.143** (4) | -3.207*** (1) | 0 |
| MGDP | -5.998* (1) | -5.915* (1) | 1 |
| EXR | -3.463** (1) | -3.648** (1) | 1 |
| INT | -6.871* (1) | -6.907* (1) | 1 |

Significant at (*)-1%, (**)-5% and (***)-10% McKinnon critical values. The values in parenthesis is the number of lag used for the test which is based on the minimum AIC and SIC

The Augmented Engle-Granger (AEG) cointegration test result reveals that the residual term generated from the model is stationary at level which implies that there exist long-run relationship between inflation and it's considered determinants-fiscal, monetary and key macroeconomic indicator factors.

Then, the cointegrating regression model result is shown in Table 2. The result reveals that growth rate of GDP, growth rate of money supply, real share of import, first lagged of inflation rate and interest rate exert positive influence on inflation rate. While, only growth rate of GDP and preceeding rate of inflation rate have significant effect on current inflation rate in Nigeria during the review period.

Also, the real share of fiscal deficit and exchange rate were found to exert negative influence on inflation rate. The mechanism of disequilibrium in the short run from the long-run equilibrium as a result of random shock effect is expressed in the Error Correction Mechanism (ECM) regression model result shown in Table 3. The estimated ECM model reveals that inflation rate is below its equilibrium value and for the error term to resort the equilibrium, inflation rate will have to increase by 1.41% in the current period.

Unlike in the long-run, change in the growth rate of GDP, growth rate of money supply, real share of import and change in first lagged of inflation rate exert positive effect on the change in inflation rate. While, only change

Table 2: Cointegrating regression results[1]

| Variables | Values | SE | Prob. |
|---|---|---|---|
| C | -11.370 | 7.798 | 0.155 |
| GRGDP | 0.284 | 0.094 | 0.005 |
| GRM | 0.188 | 0.129 | 0.155 |
| FDGDP | -1.307 | 0.757 | 0.095 |
| MGDP | 0.428 | 0.340 | 0.218 |
| $INF_{t-1}$ | 0.393 | 0.140 | 0.009 |
| EXR | -0.080 | 0.052 | 0.133 |
| INT | 0.051 | 0.409 | 0.902 |

$R^2 = 0.583$; Adjusted $R^2 = 0.481$; F-Statistic = 5.760; Prob (F-Statistic) = 0.0003; Durbin-Watson Stat = 2.063; [1]Extracted from the E-View 5.1 output

Table 3: ECM regression result[2]

| Variables | Values | SE | Prob. |
|---|---|---|---|
| C | 0.429 | 1.923 | 0.825 |
| ΔGRGDP | 0.262 | 0.065 | 0.000 |
| ΔGRM | 0.076 | 0.109 | 0.488 |
| ΔFDGDP | -0.974 | 0.538 | 0.081 |
| ΔMGDP | 0.747 | 0.275 | 0.011 |
| $ΔINF_{t-1}$ | 0.807 | 0.179 | 0.000 |
| ΔEXR | -0.173 | 0.167 | 0.308 |
| ΔINT | -0.287 | 0.438 | 0.518 |
| ECT | -1.414 | 0.248 | 0.000 |

$R^2 = 0.631$; Adjusted $R^2 = 0.522$; F-Statistic = 5.771; Prob (F-Statistic) = 0.0003; Durbin-Watson Stat = 1.966; [2]Extracted from the E-View 5.1 output

in growth rate of GDP, real share of import and preceeding rate of inflation rate have significant effect on change in inflation rate in the short-run. While changes in the real share of fiscal deficit, exchange rate and interest rate have negative contribution to change in inflation rate during the short-run review.

## CONCLUSION

Both empirical and theoretical considerations indicates that substantial benefits will accrue when moving from high or moderate rate to low level of inflation. Nevertheless, reducing inflation to a very low level helps to reduce relative price uncertainty thereby further improving resources allocation. From the empirical findings for the analysis of dynamic and simultaneous inter-relationship between inflation and its determinants, we then proffer the following policy recommendations options for policy makers and other concerned research institutes.

## RECOMMENDATIONS

The growth of the money supply should continually be kept in check given its long-run potential and magnitude of exerting inflationary pressure on the economy. Appropriate steps that will moderate the expansion of the money supply should be devised, so as to ensure stable non-accelerating price level in the economy.

Effective financial policy that will help to reduce interest rate on lending should be adopted due to the resultant effect of investment crowd-out on price level in the economy.

The structure of government expenditure should be well coordinated and distributed to other key sectors of the economy with strict supervision in order to avail the continual problem of over-spending and over-estimation of projects execution cost which might caused imbalances in price stability level in the economy.

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