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Government Expenditure and Inflation Rate in Nigeria: An Empirical Analyses of Pairwise Causal Relationship.

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Abstract
The study investigates the nature and extent of causal relationship between government expenditure and inflation rate in a 42-year period (1970-2011). Times series data obtained from the Central Bank's statistical bulletin of relevant years are analysed using descriptive(graphs and charts) and inferential (correlation, stationarity, Johansen's cointegration test and Granger causality test) analysis. The variables are stationary, weakly and inversely correlated and show longrun relationship. However, they did not granger-cause each other implying that there exists no pairwise causal relationship between them. We recommend appropriate fiscal-monetary policy mix,redirecting government expenditure to productive channels in the economy and maintaing ba strategic balance between capital and recurrent expenditure.
Keywords: Government Expenditure; Inflation Rate; Pair-wise causal relationship; Granger causality test.

1. Introduction

Government expenditure (GE) refers to money spent by the government of any nation in carrying out its constitutional responsibilities of providing social amenities for its citizenry and protecting its territorial integrity. Inflation on the other hand is a sustained rise in the general level of price in the economy while inflation rate (IFR) is the rate at which the price level increases (Blanchard, 2006). Theoretically, GE may have causal relationship with IFR, *ceteris paribus.* However, it may be merely correlated with it sometimes. The focus of this study is to investigate the nature and extent of any causal relationship (*ceteris paribus*) between these two macroeconomic variables in Nigeria in the period 1970-2011, using a pair-wise Granger Causality Analysis. Generally, low and stable inflation is the core mandate for most central banks across the globe (Okafor, 2009).

2. Theoretical and Empirical Underpinnings

The control of inflation has been a major macroeconomic policy goal in most countries of the world. In the period of inflation not all prices and wages rise proportionately and this affects income distribution negatively. For instance, retirees in many countries have payments that do not keep up with the price level and this makes them to suffer economically. Also, when some prices are fixed by law/regulation, they lag behind other prices resulting in changes in relative prices and price distortions.

Generally speaking, inflation is detrimental to long term economic growth because it erodes the standard of living and distorts economic decision-making. Also, Price increases in one sector of the economy may be transmitted to other sectors of the economy (Maku and Adelowokan, 2013). High deflation has negative economic consequences as high inflation rate. Therefore, the 'best' rate of inflation is a low and stable rate of inflation (between 0 percent and 3 percent)(Blanchard,2006). According to Komolafe (1996), Government expenditure (together with monetary and exchange rate policies) influences inflation (and other macroeconomic aggregates). Also, Addison (1996) opines that fiscal policies affect inflation and advocates for a reduction of overall expenditure in selected areas by consolidating overlapping expenditure programmes and by re-prioritization of expenditure to improve budgetary transparency. He added that government should investigate the impact of its spending on the economy so as to guide it in its future spending.

In 2008, the aggregate expenditure of the Federal Government stood at N1,380.6 billion(or 11.4% of GDP in the first half of 2008) and this is higher than the aggregate expenditure in the corresponding period of 2007(CBN,2008a). This increased value resulted from increase in personnel cost and interest payments on outstanding domestic debts; and non-debt expenditure increased by 27.8% from the level in 2007(CBN, 2008b). This trend continues as in the first half of 2009 aggregate expenditure of the Federal government stood at N1, 591.0 billion (or 13.5% of GDP in the first half of 2009). Also, this is higher than the aggregate expenditure in the corresponding period of 2008 partly due to increased recurrent expenditure especially personnel and overhead cost (CBN, 2009). As a remedy towards mitigating the problem of inflation in Nigeria, Mbutor(2008) suggested the adoption of inflation targeting (IT) since it is considered a better option in contemporary times in controlling inflation. Thingan (2011) suggests that when the pattern of public expenditure does not secure a balance between the demand and supply of goods, inflationary tendencies may set in.

An empirical analysis of the Nigerian economy of the monetary base in 2008 (4th quarter) to 2009 (2nd quarter) conducted by Akanji and Ikoku (2009) shows that a one standard deviation increase in the

monetary base (sum of currency in circulation-CIC-and bank deposits at the Central Bank of Nigeria) results in an increase in inflation. When government expenditure adds to CIC, it further increases the monetary base which in turn exerts inflationary pressures on the economy. In this regard, Uchendu (2009) suggested that inflation rate can be effectively managed through appropriate monetary fiscal policy mix, not fiscal dominance occasioned by expansionary fiscal operation of government.

According to Mc Connell and Brue (2005) increase in government expenditure may exert inflationary pressures (*ceteris paribus*) through its effect on aggregate demand by shifting aggregate demand curve to the right. The reverse is the case with a fall in government expenditure (*ceteris paribus*) as this shifts the aggregate demand curve to the left. Thus, government spending is one of the determinants of aggregate demand; other determinants include: change in consumer spending, change in investment spending and change in net export spending.

Point Of Departure or Gap to Be Filled by this Study

While we do not have sufficient studies in Nigeria that investigated the empirical relationship between GE and IFR, using the classical pair- *wise granger causality test*, we have seen this as a gap to be filled (or a point of departure for our study from previous studies). Though our study focuses on the determination of causal relationship between GE and IFR, it is necessary to first investigate the extent of correlation between them.

2.1 Research Objective

The general objective of the study is to establish the extent of causal relationship (if any) between GE and IFR in the period under investigation. However, the specific objectives are:

(i) To determine the nature and extent of correlation between GE and IFR
(ii) To determine the nature and extent of causal relationship between GE and IFR

2.2 Research questions

The study intends to answer the following research questions:

(i) What is the nature and extent of correlation (if any) between GE and IFR?
(ii) What is the nature and extent of causal relationship (if any) between GE and IFR

2.3 Research Hypotheses

The following null hypotheses are tested in this study:

(i) $H0_1$: There is no correlation between GE and IFR
(ii) $H0_2$: GE does not Granger-Cause and IFR
(ii) $H0_3$: IFR does not Granger-Cause and GE

3. Methodology

In this study we employ both descriptive (graphs and charts) and inferential (correlation, stationarity, Johansen's cointegration test and Granger causality test) analyses. We first test for the extent of correlation between GE and IFR using the pearson product moment correlation coefficient (r) while a causal design is adopted to test the extent of causal relationship between GE and IFR using the pair wise granger causality test. Econometric Views statistical software was used.

For the correlational analysis investigators generally calculate the degree of correlation by applying a coefficient of correlation to data concerning the two phenomena. The most common correlation coefficient is expressed as

$$\frac{\Sigma\left(\frac{x}{\sigma^x}\cdot\frac{y}{\sigma^y}\right)}{N}$$

in which x is the deviation of one variable from its mean, y is the deviation of the other variable from its mean, and N is the total number of cases in the series. A perfect positive correlation between the two variables results in a coefficient of +1, a perfect negative correlation in a coefficient of -1, and a total absence of correlation in a coefficient of 0. Intermediate values between +1 and 0 or -1 are interpreted by degree of correlation. Thus, .89 indicates high positive correlation, -.76 high negative correlation, and .13 low positive correlation and so on. (Singer, 2008).

For the causal analysis it should be noted that although regression analysis deals with the dependency of one variable on other variables, it does not necessarily imply causation. This implies that the existence of a relationship between variables does not prove causality or the direction of influence. The variable Y is said to be

granger-caused by X if X helps in the prediction of Y. This means that X granger-causes Y if only X's lagged values are statistically significant. In Granger causality test we can distinguish any of the following three cases:

(i) Unidirectional causality (i.e X causes Y or Y causes X but not the reverse in each case.)

(ii) Feed back (bilateral causality): In this case the sets of coefficients of X and Y are statistically significantly different from zero in both cases. i.e (X Y) and (Y →X) holds in both cases.

(iii) Independence: This is when the sets of X and Y coefficients are not statistically significant in both regressions: neither (X→Y) nor (Y X) holds. The Granger Causality equation is:

$$Y_t = \alpha_i + \sum_{i=1}^{n} \alpha i \; x_{t-i} + \sum_{j=1}^{n} \beta_i Y_{t-j} + \mu_t \qquad \text{.....e}$$

$$X_t = b_i + \sum_{i=1}^{n} \lambda i \; x_{t-i} + \sum_{i=1}^{n} \delta_i Y_{t-1} + \mu_{2t} \qquad \text{.....f}$$

Where:

Y and X represent dependent and independent variables respectively. It is assumed that the disturbances μ_{1t} and μ_{2t} are uncorrelated. **The decision rule is that if the probability value (p-value) is greater than our chosen alpha (α=0.05), we fail to reject the null hypothesis (H_0) of "… does not Granger cause… ". If it is less than alpha,(α) then we reject H_0.**

4. Data Analysis

4.1 Descriptive Analyses

The descriptive analyses show both **weak** (figures 2 and 4) and **inverse** (figures 1,3 and 5) relationship between GE and IFR.

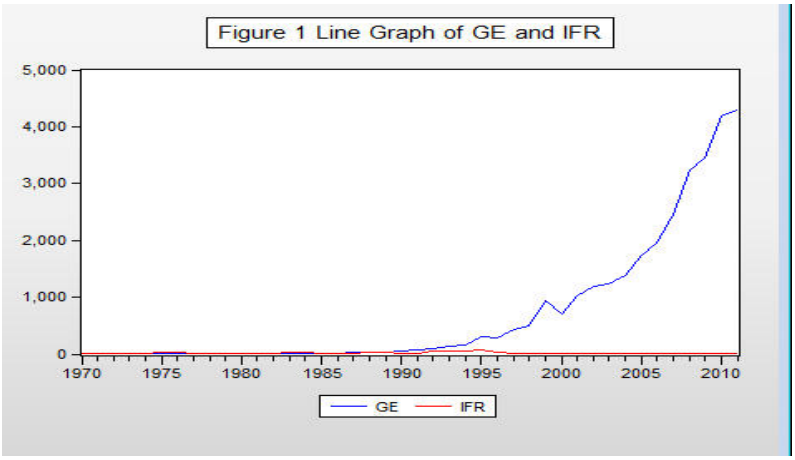

Figure 1 shows an inverse/negative relationship between GE and IFR from the early 1990s to 2011

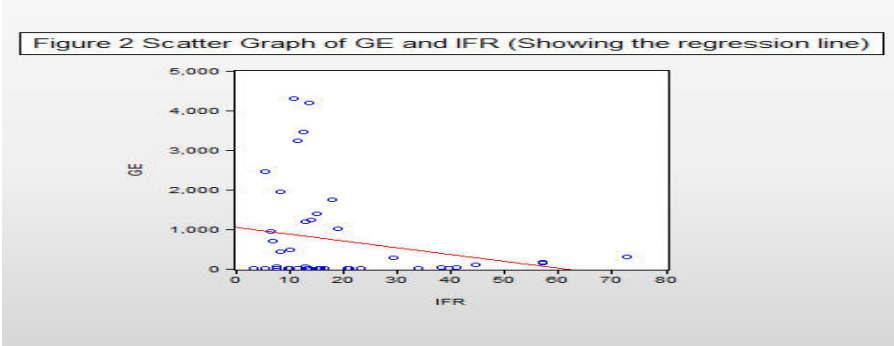

Figure 2 shows weak relationship between GE and IFR and an inverse/negative relationship is indicated by the regression line

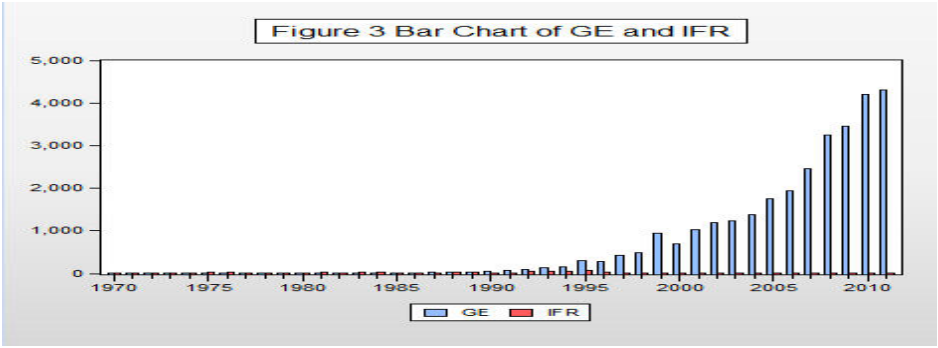

Figure 3 Shows an inverse/negative relationship between GE and IFR especially from the 1990s

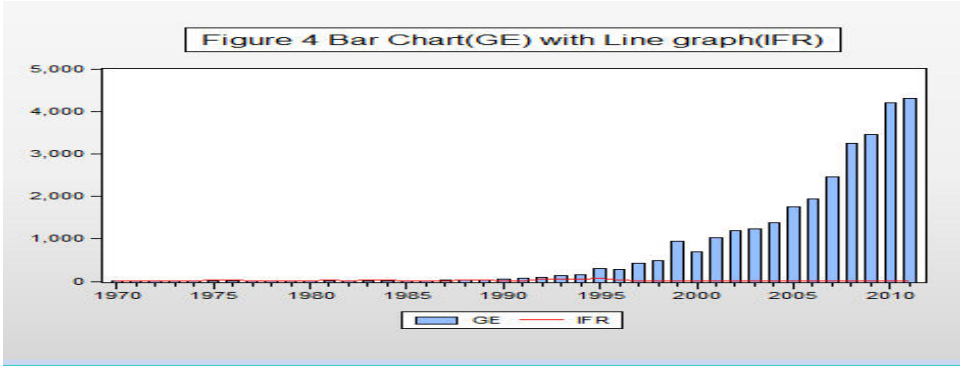

Figure 4 The mixed Bar Chart of GE and line graph of IFR show weak and inverse/negative relationship between GE and IFR

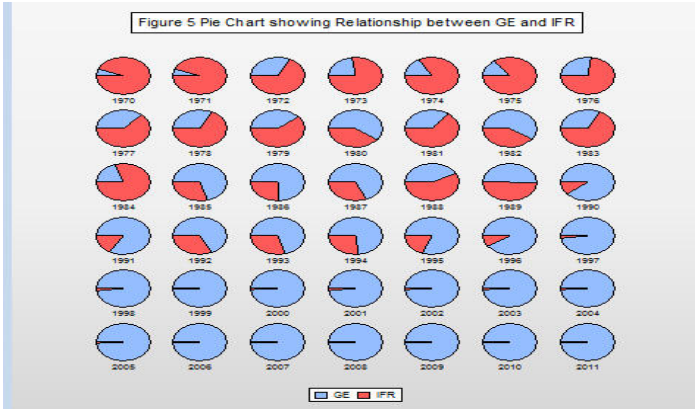

Figure 5 shows that while GE was increasing over the years inflation rate was decreasing which shows an inverse relationship

4.2. Inferential Analyses

In the inferential analyses we employ (a) correlation analysis to determine the nature and extent of correlation,(b) Augmented Dickey-Fuller test to ascertain the stationarity or otherwise in the time series data, (c)Johansen's cointegration test to determine the existence or otherwise of long run relationship between the variables and(d) a pair-wise Granger Causality test to determine the extent and nature of causal relationship between the variables.

Correlation		
	GE	IFR
GE	1.000000	-0.232604
IFR	-0.232604	1.000000

Figure 6 Correlation Matrix of GE and IFR

Augmented Dickey-Fuller Unit Root Test on D(GE)

Null Hypothesis: D(GE) has a unit root
Exogenous: Constant
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.582435	0.0007
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

Figure 7 Unit Root Test on D (GE)

Augmented Dickey-Fuller Unit Root Test on IFR

Null Hypothesis: IFR has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.593045	0.0103
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

Figure 8 Unit Root Test on IFR

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.573594	47.86966	25.87211	0.0000
At most 1 *	0.291340	13.77517	12.51798	0.0306

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 *	0.573594	34.09449	19.38704	0.0002
At most 1 *	0.291340	13.77517	12.51798	0.0306

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

Figure 9: Johanson's Co integration Test of GE and IFR

Pairwise Granger Causality Tests
Date: 12/25/14 Time: 22:22
Sample: 1970 2011
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
IFR does not Granger Cause GE	40	0.01516	0.9850
GE does not Granger Cause IFR		0.84936	0.4363

Figure 10: Pair wise Granger Causality Test on GE and IFR

5. Discussion of Results and Conclusion

Descriptive analyses show that GE and IFR are both weakly and inversely related. This is corroborated by the correlation analysis with weak (r= 0.23) and inverse (- 0.23) values. This result suggests that GE may be properly directed to productive channels in the economy and hence may not exert inflationary pressures. We therefore reject H_1 of "...no correlation between GE and IFR" as they are correlated but weakly and inversely. The Dicky-Fuller tests show that both time series variables are stationary. GE is integrated of order one:

I(1)(ADF statistic 0.0007 is less than alpha,0.05) while IFR is stationary at level ,that is, integrated of order zero: I(0)(ADF statistic 0.01 is less than alpha, 0.5).This suggests that the data are appropriate for analyses using inferential analyses.

Johansen's co-integration test shows that both Trace test and Max-eigenvalue indicate two (2) co-integrating equations at 0.05 level implying the existence of long- run relationship between GE and IFR. Granger causality tests show that both GE and IFR do not granger-cause each other (0.43 and 0.98 are both greater than alpha,0.05) and so we fail to reject H_2 and H_3 of "... does not granger-cause". Thus, there is no causal relationship between GE and IFR in Nigeria in the period being investigated. This suggests that neither GE nor IFR influences each other corroborating the weak relationship earlier established.

6. Recommendations

From the results of the study we make the following recommendations:
The government of Nigeria should:

(1) Formulate appropriate fiscal and monetary policy - mix to effectively Control money supply in the economy.
(2) Redirect GE to productive channels in the economy to increase supply of goods and services relative to demand thereby preventing upward inflationary pressures and making the economy production- based.
(3) Maintain a good strategic balance between capital and recurrent expenditure to prevent the economy from being consumption - based.

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