

Granger Causality Analysis between Domestic Debt and Inflation in Nigeria

IWEDI Marshal

Department of Banking and Finance, Rivers State University, Port Harcourt, Nigeria

E-mail: ivedimarshal@yahoo.com

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Abstract: This study investigates the casual relationship between domestic debt and inflation in Nigeria. The study used time series data collected from CBN and DMO annual report and account statement covering the period of 56 year (1960- 2016) while both the descriptive and granger causality techniques were all used to analyze the data. The result indicates that domestic debt is seen to be causally prior to inflation in Nigeria implying that domestic debt influences the general price level in the economy.

1. INTRODUCTION

Inflation is one of the severe problems confronting most countries, especially those of the developing economies. According to Asogu (1991) Inflation is a situation of rapid, persistent and unacceptably high rise in the general price level in an economy resulting to general loss of purchasing power of the currency. A period where too much money is chasing too few goods, as the general price level of commodities rises the purchasing power of money (value of money) falls. This is why inflation is seen as a major macroeconomic indicator that provides an insight into the state of the economy. On the other hand, domestic debt is an essential tool employed by the government to fund both internal and external gaps (Muhammad et al, 2012). As such, it behooves on the managers of the nation economy to efficiently and effectively utilize the resources from debt. Mismanagement of debt creates problem for the economy which inflation pressure is one of them. Going by this some scholars have established that there is a direct link between domestic debt and inflation. Bildirici

and Ersin (2007) findings show that the cost of domestic debt increases on account of inflation. Similarly Ahmad et al (2012) observes that domestic debt and domestic debt servicing enhance the price level in Pakistan. They further reported that the volume of domestic debt and domestic debt servicing on price level is found to be positive and statistically significant. While Yien Abdullah and Azam (2017) in their study show that domestic debt and external debt have a strong positive association with inflation. Secondly, inflation was found to granger caused domestic debt.

The Nigeria domestic debt stock outstanding was N11,058.20 billion as at end-December, 2016, as against N8,837.00 billion as at end-December, 2015, representing an increase of N2,221.21 billion or 25.14 percent. This development was largely due to the reliance on domestic debt to fund rising budget deficit and refinancing of matured domestic debt obligations. The composition of the debt portfolio was consistent with the debt strategy of using more of longer dated instruments to minimize refinancing risk. Further review shows that, the stock of FGN Bonds and Nigeria Treasury Bonds increased from N4,080.05 billion and N2,122.93 billion in 2012 to N7,564.94 billion and N3,277.28 billion in 2016, respectively. The stock of Treasury Bonds has continued to go down from N334.56 billion in 2012, to N215.99 billion in 2016, due to a gradual redemption of the instrument over the years without new issues. Despite this, the monetarist school of thought maintained that inflation is a monetary phenomenon, which suggests that in an economy, any activity that increases the volume of money supply to a level beyond the economic capacity would put tremendous pressure on average prices of goods and services, especially when there is no corresponding increase in the latter. It would be argued that when the government mops up a good quantity of money in circulation by way of borrowing from its citizens, reasons suggests that less money would remain in the hands of the public at that point in time. Having less to spend by the consuming public, the pressure on prices of goods and service would reduce, *ceteris paribus*. It will be recalled that a major component of the domestic debt related to treasury securities, by which the government through the Central Bank attempts to mop excess liquidity and put a lid on prices. Thus it is not out of place to say that domestic borrowing is a tool of inflation targeting.

However, the big question beckoning for answer is to what extent has the CBN succeeded in this? Available statistics shows that Nigeria's year-on-year headline inflation entered into the double-digit range in February, 2016 at 11.38 percent, from the 2015 year-end inflation of 9.55 percent, it went up to 18.55 percent by December, 2016. This was significantly above the recommended threshold of the

West African Monetary Zone (WAMZ) convergence inflation rate of 5.0 percent. The rise in inflation was attributed mainly to foreign exchange shortages and hike in energy prices, amidst poor power supply. Judging from this, can it be concluded that the domestic debt policy of the federal government aimed at mopping up excess liquidity in the country has not been an effective tool for checking inflation? This is an empirical question that previous studies in Nigeria are yet to answer. The answer to this question forms the focal point of this study. This is the driving force behind this study. Hence, this study aims to find the importance of the causal relationships between inflation and domestic debt in Nigeria thereby assisting policy makers in the future in identifying the source of inflationary pressure and implementing a suitable fiscal reform in Nigeria.

2. LITERATURE REVIEW

2.1. Theoretical Foundation

Learner's Theory of Domestic Debt

This theory postulates that when the government borrows from its own particular resident's that is when domestic or informal obligation is utilized to fund government expenditure, no burden is made for the future generation. Maybe, the individual from the future generation just owe it to one another. Consequently, when the debt is paid off, there is an exchange of income from one group of citizens (the individual who does not hold bonds) to another (bondholders). But, when a nation borrows from the external economy to finance current spending, which we allude to as foreign obligation the future era surely bears a burden, on the grounds that, its utilization level is lessened by a sum equivalent to the loan in addition to the collected interest that must be sent to the outside lender and if the loan is renegotiated, just the interest must be paid.

Overlapping Generation Theory of Domestic Debt

The overlapping generation model suggests a natural framework for comparing across generations the burdens and benefits of government fiscal policies. This framework called generational accounting by Auerbach, Gokhale and Kettikof (1991) in Nwinee and Tobira (2012), involves the following steps: First, take a representative person in each generation and compute the present value of all taxes he or she pays to the government. secondly, calculate the present estimation of all transfer got from the government. The difference between the present estimation of the taxes and transfers

is the net tax by a member of that generation. By comparing the net taxes paid by different generations. One get a sense of low government policy redistributes income across generations.

Neoclassical Theory of Deficit Finance

This theory opined that when the government initiates a project, whether financed by taxes or by borrowing, financial resources are removed from the private sector. One usually assumes that when tax finance is used, most of the resources removed come at the expense of consumption. On the other hand, when the government borrows, it competes for funds with individual and firms who want the money for their own investment project. Hence, it generally assumed that debt has most of its effect on private investment. To the extent that these assumptions are correct, debt finance leaves the future generation with a smaller capital stock, *ceteris paribus*; its members therefore are less productive and have smaller real income than otherwise would have been the case. Thus, event in learner theory/model, the debt can have a burden. The mechanism through which it works is the reduction of capital formation.

Demand-Pull Theory of Inflation

The Demand-Pull Theory posits that a rise in price is initiated by the emergence of excess demand over existing supply, assuming the existence of full-employment in the economy. The amount of inflationary pressure would depend upon the size of the excess demand (Perlman, 1965). Demand-Pull inflation is situation often described as “too much money chasing few goods”. According to this theory, an excess of aggregate demand over aggregate supply will generate inflationary rise in prices (Jhingan, 1985). Demand- Pull inflation could be approached through either quantity theory of money (old and new views) or Fiscalist/Keynesian theory. Quantity theory emphasizes the causal influence of money supply in the inflationary process that is price rises proportionately to the increase in money supply. But the Fiscalist theory emphasizes fiscal influences such as government expenditure and public debt.

Cost-Push Theory of Inflation

Cost-Push inflation occurs where cost of factor services or inputs in the production process rise independently of the level of demand for the goods or services in question. Cost-Push inflation is caused by the wage increases enforced by unions and profit increases by the employers. This type of inflation is not a new phenomenon; it was found even during the medieval period. But it was reviewed in the 1950s and

again in the 1970s as the principal cause of inflation. It also came to be known as the “New Inflation” (Jhingan, 1985). Cost-Push inflation is caused by wage-push and profit-push. The basic cause of cost-push inflation is a more rapid rise in money wages than the productivity of labor. Also, an increase in the prices of the domestically produced or imported raw materials may lead to cost-push inflation. Since raw materials are used as inputs by the manufacturers of finished goods, they bear on the cost of production and stimulate an increase in commodity prices. Thus, a continuous rise in the prices of raw materials tends to set off a cost-push-wage spiral. Another cause of cost-push inflation is profit-push inflation. Oligopolist and monopolist firms raise the prices of the products to offset the rise in labor and production costs so as to earn higher profits or to raise the pay cheques of employees. This increase in product price in order to earn higher profits or to raise wages increases the rate of inflation of an economy. Profit-push inflation is also referred to as administered -price inflation or price-push inflation.

Galbraith (1975) is of the opinion that cost-push inflation arises from the fact that so many individuals have control over their incomes. These controls are enforced through strong labor and employers’ unions which act to improve the lots of their members. The labor unions demand for increased wages and salaries without necessarily ensuring a corresponding increase in productivity. The employers on their part pass on this increase in cost to consumers by raising the prices of their products.

Structuralist Theory of Inflation

Structuralist links inflation to economic growth in the developing economies. Because of the structural and institutional constraints that characterize the region, any attempt to increase economic growth brings with it an increase in prices. Asogu (1991) says that “structural inflation is said to result from supply shocks including insufficient foreign exchange supply for financing importation.” This is prevalent in underdeveloped economies; hence the explanation of inflation in developing countries, especially those undergoing adjustment programmes, follows the structural theory. Since the barometer for gauging the impact of foreign exchange shortage in the demand-supply relationship is exchange rate, its depreciation and undervaluation is claimed to worsen inflationary pressures. The Structuralist analysis concerns largely with the identification and examination of the alleged structural constraints, what Sunkel (1960) refers to as basic or structural inflationary pressures. Sunkel opines that “inflation does not occur in vacuum but as part of a country’s historical, social,

political and institutional evolution, the underlying, causes of inflation in underdeveloped countries.” These structural constraints are generally taken to be food supply constraints, foreign exchange constraints as well as financial constraints. Therefore, the existence of these bottlenecks does not directly cause inflation, but it may trigger off an inflationary spiral. For instance, the Structuralists argue that urbanization and rising incomes may lead to a rapidly rising demand for food stuffs which cannot be met by the agricultural sector. The supply response of the agricultural sector is poor because of the structural constraints within that sector and this inelastic supply constitutes a structural inflationary factor.

Imported Inflations Theory

Internationally Transmitted Inflation, otherwise called imported inflation, arises from openness of economies. This theory identifies a number of channels whereby inflation may be transmitted from one country to another, especially under a regime of fixed exchange rates. The channels include price, demands and/liquidity effects. Price effects are transmitted by internationally traded goods and services; demand effects by spill-over of excess demand across countries. Changes in foreign reserves, occasioned by balance of payments adjustment, affect money supply, income, prices, thereby creating liquidity effects.

Expectational Theory of Inflation

When there is an expected rise in the prices of goods and services, people tend to buy more even at the presently high prices. Thus, they quicken the arrival of the expected inflation. That is, if people expect the price of goods to rise next month, they will respond by buying more goods and services this month. Such action has always led to an increase in the general price level. It is, however, important to note that anticipated inflation is not as harmful as unanticipated inflation. The argument here is that if wealth-holders know the rate of inflation that will occur next year, they will know how to adjust their portfolios.

Institutionalist Theory of Inflation

This theory argues that price moves autonomously and independently from evolving market conditions. Price movement emerges as a response to specific “sociological and socio-political forces or institutional arrangement” (Hagger, 1977). Such broad movement in the price level is accountable for by dominant impulse forces either with fiscal or monetary process (Nwikina, 1996).

2.2. Empirical Review

Abinitio, it was discovered that there exist a close link between domestic debt and inflation. There is a scanty literature on the nexus between domestic debt and inflation as most researchers are focusing on studying either the impact of domestic debt or external debt on economic growth. However, very few empirical studies have been conducted regarding this link. We have reviewed few of these works for this paper. Sargent and Wallace (1984) in their study reported that an increase in public debt is typically inflationary in highly indebted countries (Kwon *et al.*, 2009). Wheeler (1999) investigates the macroeconomic impacts of government debt in US by applying variance decompositions and impulse response functions for the period of the 1980s and 1990s. The author tests the Ricardian Equivalence hypothesis by examining the impact of government debt on output, price level and interest rates. The results of the study show that government debt has a negative and significant impact on interest rates, price level and output. Catao and Terrones (2005), found a long run, strong, positive relationship between deficits and inflation over 107 countries over 1960-2001 particular in high-inflation and developing country groups with dynamic panel techniques. Tan (2006) investigated the short-run and long-run relationship between deficits, inflation and economic growth in Malaysia from 1966 to 2003; it found that deficits had a short-run inflationary effect on the economy. Kannan and Singh (2007) also found that deficits and debt have a negative impact on inflation during 1971 to 2006 in India. Bildirici and Ersin (2007) conclude that inflation fed on the rising costs of domestic public debt. Kannan and Singh (2009) trace out policy conduct and stability of public debt in India by capturing the dynamic interaction of deficits and debt with macroeconomic variables such as inflation, interest rate, trade gap and output by applying a 2SLS simulation technique for the period of 1971 to 2006. The study finds that fiscal deficits and debt have an adverse impact on all the macroeconomic variables under consideration in the medium to long run. Bassetto and Butters (2009) also found no relationship between surpluses and inflation in 52 countries including Malaysia during 1970-2008.

Habibullah *et al.*, (2011) with granger causality confirmed existence of a long-run relationship between deficits and inflation in selected 13 Asian countries. Nouri and Samimi (2011) found the positive and significant impact of debt and inflation during 1990-2008 in Iran. Pekarski (2011) concluded that worsening public finance or rising deficits might not account for the rising inflation in high-inflation economies. Muhammad *et al.*, (2012) found public debt is one of the causes of the budget deficit in Pakistan and, hence, inflation during 1972-2009. Faraglia *et al* (2012)

examined the impact of government debt maturity on inflation using dynamic stochastic general equilibrium (DSGE) model. They used the following variables: Fiscal Insurance, Fiscal Sustainability, Government Debt, Inflation, Interest Rates and Maturity. The result showed that the persistence and volatility of inflation depends on the sign, size and maturity structure of government debt and remains significantly incomplete even with long bonds and inflation which plays a minor role in achieving debt sustainability. They concluded that issuing long term debt does enable governments to use inflation more to achieve fiscal sustainability. The longer the maturity of debt, the more volatile and persistent is inflation. However the relative impact on inflation is modest and the relative importance of inflation in achieving fiscal sustainability is modest whatever the length of maturity. A more substantial contribution to debt stabilization comes from twigging interest rates.

Pelesai and Oyinpreye, (2013) found that the relationship between budget deficit and inflation is positive and significant in most countries in the long run, in 15 Economic Community of West African States (ECOWAS) countries during 1980 to 2011. Ojo and Awodele (2013) found a statistical relationship at 5% significance level between domestic debt and inflation in Nigeria. Jalil, Tariq, and Bibi (2014) using the autoregressive distributed lag, found positive debt relationship with inflation for Pakistan from 1972 to 2012. Khieu (2014) found deficit has no bearing on inflation in Vietnam during 1995 to 2012 with structural vector autoregression. Essien et al, (2016) found that the level of domestic debt over the period of their study had no significant impact on the general price level and output in Nigeria. Furthermore VAR impulse response result on the other hand showed that the prime lending rate and CPI responded positively to shocks in innovations from the external debt but reacts negatively over the periods to shocks in innovations from the domestic debt. This confirmed the inflationary tendencies of increased public borrowing which increases government expenditure as well as the attendant changes in interest rates arising from the increase in credit to government which crowds out private borrowing. Yien *et al* (2017) in their study found that domestic debt and external debt have a strong positive association with inflation in Malaysia. Secondly, inflation was found to granger caused domestic debt.

3. METHODOLOGY

3.1. Data Description and Source

This paper used time series data for the period 1960 to 2016, which were sourced from various editions of the Central Bank of Nigeria (CBN) Statistical Bulletin, Annual Report & Statement of Accounts and Debt Management Office Annual

Report. To capture domestic debt in Nigeria, we used data on short term domestic debt stock (Treasury bills Treasury certificate and Treasury bond) and long term domestic debt stock (Development Stocks and Federal Government Bonds), while the nation inflation (general price level) was captured using the average CPI for the various years under study.

3.2. Estimation Techniques

To achieve the core objective of this paper of analyzing domestic debt and inflation in Nigeria, this section adopted the granger causality model to investigate the effects of domestic debt on one of the key of macroeconomic variable (inflation). Granger (1986) proposed the concept of causality and exogeneity: a variable Y_t is said to cause X_t , if the predicted value of X_t is ameliorated when information related to Y_t is incorporated in the analysis. The test is based on the following equation below

$$Y_t = \alpha_0 + \sum_{i=1}^n \alpha_i Y_{t-i} + \sum_{i=1}^n \beta_i X_{t-i} + \mu_{1t} \quad (1)$$

and

$$X_t = \alpha_0 + \sum_{i=1}^n \alpha_i X_{t-i} + \sum_{i=1}^n \beta_i Y_{t-i} + \mu_{2t} \quad (2)$$

Where X_t and Y_t are the variables to be tested while μ_{1t} and μ_{2t} are white noise disturbance terms and n is maximum number of lags. The null hypothesis $\alpha_1 = \beta_1 = 0$ for all 1's is tested against the alternative hypothesis $\alpha_1 \neq 0$ and $\beta_1 \neq 0$, if the coefficient of α_1 are statistically significant, that of β_1 are not, then X causes Y . If the reversal is true then Y causes X . However, where both coefficient of α_1 and β_1 are significant then causality is bi-directional.

Unit root test was used to test for the stationarity of the variables to ascertain their order of integration, the Augmented Dickey Fuller (ADF) tests were carried out on each of the variables while the non-parametric approach of both the descriptive statistic and graphical methods that include line graph were also employed to uncover the underlying structure of the dynamic behavior.

3.3. Model Specification

The variables to be explained are the inflation rate. Both theoretical and empirical literature shows that all variables to be modeled below have high theoretical

connection with inflation. In all, we can represent the relationship between domestic debt and inflation in Nigeria by the following expression:

$$INF_t = f(STD_t, LTD_t, MOS_t, GDP_t) \quad (3)$$

To have the estimable version of above equation, equation (4) can be rewritten to have

$$INF_t = \alpha_0 + \beta_1 STD_{t-1} + \beta_2 LTD_{t-1} + \beta_3 MOS_{t-3} + \beta_4 GDP_{t-4} + \mu_{it} \quad (4)$$

Where

INF = Inflation Rate

STD = Short -term Domestic Debt

LTD = Long term Domestic Debt

MOS = Money Supply Growth

GDP = Growth rate of Gross Domestic Product

α_0 = Constant

$\beta_1 - \beta_3$ = Coefficients of Independent Variables

μ_{it} = Error Term

4. EMPIRICAL RESULTS AND DISCUSSION

Figure 1: Graphical analysis

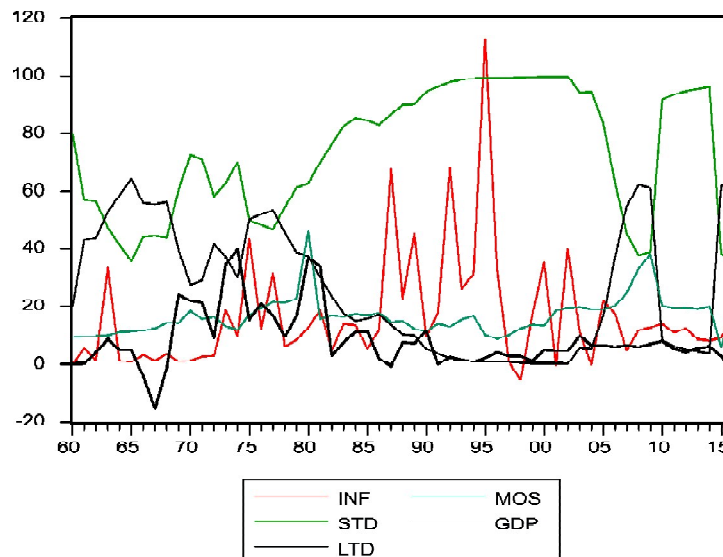


Table 1: Descriptive Statistics Result

	<i>INF</i>	<i>STD</i>	<i>LTD</i>	<i>MOS</i>	<i>GDP</i>
Mean	16.57702	73.75667	26.24333	16.56140	8.291579
Median	11.60000	80.00000	20.00000	16.10000	6.000000
Maximum	113.0800	99.86000	64.71000	46.10000	39.90000
Minimum	-5.670000	35.29000	0.140000	5.900000	-15.74000
Std. Dev.	20.28837	22.42948	22.42948	6.830205	10.23828
Skewness	2.530017	-0.312133	0.312133	2.059727	1.319295
Kurtosis	11.09159	1.584884	1.584884	9.109546	5.171793
Jarque-Bera	216.3096	5.681620	5.681620	128.9541	27.73725
Probability	0.000000	0.058378	0.058378	0.000000	0.000001
Observations	57	57	57	57	57

Source: E view 9.0 Output

Table 1 presents the result of the descriptive statistic. The skewness measure the asymmetry of the distribution of the series around its mean while kurtosis measures the normality of the series. For a distribution to be normal, it kurtosis most usually be peak at >3 and flat at < 3 . In any case, if the kurtosis is >3 , the distribution is known to be peak otherwise it will be flat < 3 . For this study, all the variables under review demonstrates peak distribution except for two variables that measures domestic debt (*STD* and *LTD*) that demonstrate flat distribution. However, the Jarque-Bera tests whether the series (variables) are normally distributed and measures the difference between the skewness and kurtosis. As shown in table 4.1 the following series *MOS*, *GDP* and *INF* are normally distributed while *STD* and *LTD* are not.

Table 2: Unit Root Test

	<i>D(INF)</i>	<i>D(STD)</i>	<i>D(LTD)</i>	<i>D(MOS)</i>	<i>D(GDP)</i>
ADF Statistics	-9.313032	-4.327603	-4.327603	-7.111993	-8.549639
1%	-3.5547	-3.5547	-3.5547	-3.5547	-3.5547
5%	-2.9157	-2.9157	-2.9157	-2.9157	-2.9157
Probability	0.000000	0.000001	0.000001	0.000000	0.000000

Source: E-view 9.0 Output

The ADF test results indicate that all the variables under study were stationary at first difference I (1). In each case, the test statistic exceeded the critical value at 5 percent significance level.

Table 3: Pairwise Granger Causality Tests

<i>Null Hypothesis:</i>	<i>Obs</i>	<i>F-Statistic</i>	<i>Probability</i>
STD does not Granger Cause INF	56	4.03142	0.04977
INF does not Granger Cause STD		1.03116	0.31450
LTD does not Granger Cause INF	56	4.03142	0.04977
INF does not Granger Cause LTD		1.03116	0.31450
MOS does not Granger Cause INF	56	0.06345	0.80210
INF does not Granger Cause MOS		0.46448	0.49850
GDP does not Granger Cause INF	56	0.23892	0.62700
INF does not Granger Cause GDP		0.00269	0.95887
MOS does not Granger Cause STD	56	3.11301	0.08343
STD does not Granger Cause MOS		2.23968	0.14044
GDP does not Granger Cause STD	56	0.02070	0.88615
STD does not Granger Cause GDP		1.50377	0.22551
MOS does not Granger Cause LTD	56	3.11301	0.08343
LTD does not Granger Cause MOS		2.23968	0.14044
GDP does not Granger Cause LTD	56	0.02070	0.88615
LTD does not Granger Cause GDP		1.50377	0.22551
GDP does not Granger Cause MOS	56	0.00898	0.92487
MOS does not Granger Cause GDP		2.79127	0.10067

Source: E view 9.0 Output

From table 3 above, the pairwise granger causality test reveals that at 5% level of significance there is a bidirectional existing between short term domestic debt (STD) and inflation, long term domestic debt (LTD) and inflation, money supply and short term domestic debt and money supply and long term domestic debt. In that, STD and LTD leads inflation while causality also flow from inflation to STD and LTD respectively. This suggests that if domestic debt increases, the prices of goods also increases in the same direction if such borrowings are not channeled toward increasing economic activity. The economic implication behind this is that when the government borrows directly from the Central Bank to finance either recurrent expenditure or trade deficit, money supply increases which also trigger the price level of goods and service as explained in the theory of demand pull inflation. On the other hand, the result also reveals the case were price level does cause domestic debt. This is in line with the empirical findings of Panizza (2008) and Yien etal, (2017). Their findings show that domestic debt does not cause inflation, though price does cause domestic debt. When too much money is chasing too few goods it

suggest that the level of money supply in circulation in country is beyond the capacity the economic can carry and it behooves on the government through the CBN to mop up quantity of money in circulation by ways of borrowing from its citizens. This means that when the government borrows less money would be left in the hands of public who we also have less to spend while the pressure on prices of goods would reduce. With this it can be infer that changes in domestic debt help to explain the changes inflation and vice versa. Furthermore, a look at table also show that a unidirectional causality running from short term domestic debt (STD) to Gross domestic product and long term domestic debt (LTD) to Gross domestic product and vice visa. This implies that an increase in domestic debt either short term or long term can trigger up an active economy, which in turn can boost the desire for more investment in the country. This means that domestic debt had impact on economic growth. Also it implies that most of the domestic borrowings in the country within this period were growth oriented. Finally, we also discovered that money supply actually influenced GDP and not vice visa. This shows that there is a unidirectional causality from money supply (MOS) to GDP in Nigeria. This empirical finding collaborate the finding of Iwedi (2016).

5. CONCLUSION

This study has analyzed domestic debt and inflation in Nigeria using the methodology of the Pairwise Granger Causality analysis. The analysis began with the unit root test, thereafter; the descriptive test was conducted to ascertain the behavior of the variables under investigation. Applying the methodology of the econometric test on 56 observations of a time series data covering the periods 1960 to 2016, the study revealed an interesting number of findings: first is all the variables under study were found stationary at first difference i.e. all variables are 1(I). The granger causality test revealed the case of a unidirectional causality running from short term and long term domestic debt and general price level in Nigeria.

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