



# The Implications of Rising Public Debt on Unemployment in Nigeria: An Auto Regressive Distributed Lag Approach

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## Authors' contributions

The research was jointly done by all the authors. Author OSI developed the structure of the study, wrote the protocol and the initial draft of the manuscript, Author ACI managed the typesetting, reviewed theoretical and empirical literature, including the development of the model of the study, author NUG did the econometric analysis and interpretation while author ICO supervised the research process and edited the final manuscript. All authors read and agreed on the final manuscript.

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## ABSTRACT

This study examined the implications of rising public debt on unemployment in Nigeria (1980-2015) using the auto regressive distributed lag model and Wald test econometric analytic tools. The findings of the study indicate a long run relationship between the dependent and independent variables. It is estimated from the ARDL long run test that 1% increase in public debt on the average, will bring about 1.6% increase in unemployment rate (UNEM). The result from the ARDL long run test reveals also that 1% increase in GDP growth rate on the average will bring about 0.12% decrease in unemployment rate (UNEM). On the other hand, it was found that 1% increase in inflation rate will bring about 0.2% decrease in unemployment. The study therefore concludes that public borrowing in Nigeria has not created its desired impact in the economy; hence the increase in public debt has not reduced unemployment. Also, rapid increasing debt service obligations constitute an obstacle to the implementation of new development oriented projects; therefore, worsening unemployment situation in the economy. The study therefore, makes the following recommendations: firstly, that public borrowing should strictly be for capital projects that have the capacity to create jobs only. Secondly, economic sector projects should have positive

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internal rate of return as high as the cost of borrowing and government should imbibe high level of transparency in public expenditure and procurement process. Finally, over bearing domestic borrowing should be discouraged as these crowds out private sector investment and consequently compounds our unemployment issues since the government naturally cannot compete with the private sector.

*Keywords: Public debt; unemployment; tax burden; debt overhang; economic growth; fiscal policy; ARDL.*

## **1. INTRODUCTION**

### **1.1 Background to the Study**

Public debt is the sum of the nation's debt both of local, state and national governments. It is an indicator of how much government expenditure is funded by borrowing as an alternative to taxes. According to [1], debt results from borrowing, hence debt refers to the resources of money in use in an establishment which is not generated by its owners and does not in any form belong to them. It is a commitment represented by a financial instrument or its equivalent. Public debt emanates from money borrowed by government. It can either be internal (domestic) or external in which case it is borrowed from international market or organizations outside the country of origin to finance domestic investment. Therefore, public debt is seen as all claims against government in the economy, either by her citizens or by foreigners, whether interest bearing or not [2]. In general terms, every obligation of a government (as well as currency obligation) are included in the public debt. Such obligations include the currency, short term debt, floating debt and funded debt. Public debt can be domestic or foreign, gross or net, marketable or non marketable, short term, medium term or long term, interest bearing or non interest bearing [2].

In the 1970s, the excess proceeds from the sale of crude oil triggered the indigenization policy of the government which involves government intervention to acquire and control on behalf of the Nigerian people the larger part of the productive assets of the country. Prior to the indigenization policy in Nigeria, foreigners dominated the ownership and management of such firms. This policy led to the massive acquisition of industries by both private investors and governments of Nigeria. Consequently, in the 1980s, the international energy crises and decline in prices of crude oil, made it difficult for the massively acquired industries to be sustained due to poor revenue accruable to government. This development led to the collapse of many

industries and subsequent massive retrenchment of workers, worsening an already increasing unemployment problem in the economy. In other to mitigate this challenge, the government started exploring other revenue sources leading to the contraction of both domestic and external debt burden that has not abated till date.

During periods of unemployment, borrowing can be considered as a substitute to money creation and by implication as tool of fiscal policy. External borrowing is believed to be a means of bridging domestic savings gap especially in times of falling government revenues from internal sources. It is particularly so in the face of fluctuating prices of primary commodity exports and hence declining foreign exchange earnings. External borrowing is also seen as a means of assisting developing countries increase its rate of real investment in addition to promoting economic growth. Public debt therefore acts as a source of capital formation and by implication a means of generating employment opportunities. Domestic borrowing also acts as an anti inflationary measure by mobilizing surplus money in public domain thereby controlling money supply. Such idle funds can be diverted from unproductive to productive investment channels in the economy which can also boost employment creation.

Once a public debt is incurred servicing of the debt is mandatory, through the payment of interest and amortization charges as and when due. As the debt profile is increasing so also is the interest repayment. If the entire amount of the interest charges were to be paid with tax revenue, then the total amount of tax collection must also go up persistently thereby placing a burden on the general population. Thus, the burden of public debt should not be measured by the absolute amount of interest charges but by the rate the extra tax burden creates in the national income, thereby making interest payment a social cost.

In Nigeria, as in other developing economies of the world the issues associated with debt

servicing, tax increase aimed at defraying additional cost as result of the debt calls for concern especially against the background that both domestic and external debts are incurred without considering whether such loans have positive internal rate of return as high as the cost of borrowing and are subsequently misappropriated by corrupt politicians in power hence denying the populace the expected gain that should accrue if these monies were invested in productive ventures and as a result making it impossible for these volumes of debt to contribute to National development through employment creation. Rapidly increasing debt service obligations constitute an obstacle to the implementation of new development oriented projects since a proportion of revenue for this purpose is set aside for servicing previous debts.

Some scholars argue that the real burden of public debt is indeed shifted to the future generation [3]. In his public principles of public debt opines that public debt in contrast to tax finance transferred the cost of collective activity onto future generations. Buchanan noted that present tax payers had their taxes reduced through debt finance, and that lowering of taxes was offset by higher taxes paid by tax payers in the future to pay back the debt [3,4]. These scholars believe that successive generations bear a burden in the form of an uncompensated distortion of their ideal pattern of consumption. Debt burden they believe is evident in increased unemployment resulting from low investment as a result of high interest payment and negative effects of tax disincentives (tax used for interest payment). However, other scholars disagree on the moral issues associated with public debt. The critics believe that public debt was identical to taxation in that the cost of collective activity was always borne in the present as shown by the maxim; we owe it to ourselves. These scholars contend that if funds are borrowed and appropriately channeled into productive ventures, not only will this create employment in the economy, the profit generated from such investments can also be used to service such debt. It is the opinion of this study that the issue to be discussed here should lie on how loans whether domestic or external are used and not necessarily whether the burden is borne now or passed on as this depends on the proper application of the fund.

This concern becomes more worrisome when you consider public borrowing in the developing economies where lack of accountability,

mismanagement, corruption, embezzlement and misappropriation reign. For instance, public borrowing in Nigeria has been pushed to a level where it is crowding out essential private sector investment because interest rates are pushed far and the ability of the financial institutions to lend to the private sector is reduced by the statutory appropriation of savings entrusted in their care. Moreover, certain level of fiscal irresponsibility can also be traceable to assumed cheap monies obtained from international sources. Were this funds raised from internal source (taxes) Nigerian government would have applied some caution in their fiscal operations. Public borrowing has resulted in distortion of savings decisions in Nigeria and repudiation risk due to our inability to obtain new loans owing to loss of confidence in our ability to either repay back or meet interest obligation.

In Nigeria, the unemployment rate measures the number of people actively looking for a job as a percentage of the labour force. People are considered unemployed when they are aged between 15 and 64 and are unable to be engaged productively in the economy. This category therefore, fall in the economically active segment of the population, they are also believed to be available for work and seeks a job. People, who choose to stay at home, are full time students or ill and unable to work, such are not counted as unemployed. Apart from representing an enormous waste of a country's manpower resources, it generates welfare loss in terms of lower output thereby leading to loss of income and wellbeing [5,6]. Unemployment is a very serious issue in Africa and particularly Nigeria with its rising population. The need to avert the negative effects of unemployment has made the tackling of unemployment problems to feature very notably in the development objectives of many developing countries. By the way, a good number of these countries' economies are also noted for little output. Hence, it seems obvious to many policy makers that, there must be a straight forward connection between productivity and unemployment. Obviously, it is not every contractual obligation of the national government that discourages private investment in the economy. Increase in the productive capacity of an economy facilitates debt services because as the capital stock increases, the marginal productivity of investment decreases. Some theorist believes that it is only at certain levels of borrowing that public debt can have negative impact on the economy. As a nation's capacity to borrow reduces, her ability to increase her capital

stock declines, leading to a drop on growth and worsening of unemployment situation in the economy.

### **1.1.1 Current trends on public debt and unemployment in Nigeria**

According to [7] Nigeria's total internal and external debt stock stood at N12.06 trillion or \$63.5 billion as at the end of March 2015, up from N11.2 trillion or \$67.726 billion in December 2014 according to figure released by the Debt Management Office (DMO). The sudden rise in the naira quantum of the outstanding debt is mainly due to the devaluation of the naira against the dollar. According to DMO, the total external debt of the federal and states stood at \$9.464 billion or N1.864 trillion as against the \$9.711 billion as at December 2014. Federal Government domestic debt DMO said stood at \$43.185 billion as at March 2015 against the figure of N7.9trillion or \$47.05 billion in 2014. This gives a grand total of \$63.506 billion or N12.06 trillion. As at December 2015, the total debt stock of the Federal Government and the 36 states of the federation including the Federal Capital Territory amounted to N11.243 trillion or \$67.726 billion. States and the Federal Capital Territory as at 31st December 2014 had a domestic debt profile of N1.707 trillion or \$10.967 billion. Federal Government's domestic debt, on the other hand, stood at \$47.05 billion or N7.9 trillion, while those of the states stood at \$10.97 billion or N1.708 trillion. Federal Government's domestic debt is made up of N5.370 trillion bonds, N2.885 trillion Treasury bills and N271.2 billion treasury bonds. But as at June 2015, states in the federation had a domestic debt stock of N1.551 trillion or \$9.963 billion. The Federal Government's share of the rising external debt then stood at \$6.363 billion. As at December 2015, \$3.146 billion of the debt owed by states were borrowed from multilateral institutions while \$118.9 million were bilateral loans.

In the case of the Federal Government, \$3.652 billion were loans sourced from multilateral institutions while a total of \$2.793 billion were loans obtained from China Export-Import Bank and the funds the Federal Government raised from Eurobond. Lagos, Kaduna, Cross River, others have high external debt profile The external debt profile of states has shown that Lagos State has the highest with a profile of \$1.087 billion, followed by Kaduna State with a total of \$234 million. Cross River State followed

closely with an external debt profile of \$131.469 million. Other states with relatively large external debt are Edo \$123 million, Ogun \$109 million, Bauchi \$87million, Enugu \$62 million, Katsina \$78 million, Osun \$67 million and Oyo State \$72 million [8].

The unemployment rate in Nigeria has also been fluctuating not following a consistent trend with public debt. Economic theory posits that a rise in public debt increases capital investment which by implication should reduce unemployment in the economy. It is obvious from the information above that public debt in Nigeria has been on the increase despite the debt forgiveness to the tune of \$18 billion received by Nigeria from Paris club since year 2005 including the subsequent payment of \$12 billion to offset the remaining debt, there is no evidence of accelerating pace of growth and development (employment creation) in the country. Unemployment rate in Nigeria was 4.8(1970) 3.8 (1975) 6.4(1980) 6.1 (1985) 3.5 (1990) 1.9(1995) 18.1(2000) 11.9(2005) 21.1 (2010) 8.2(2015) [9]. It is obvious from the above details that these trends do not follow postulations in economic theory hence this study is aimed at investigating the implications of this development on unemployment.

This paper is organized into five sections, section one comprises the introductory background of the study. Section two covers the theoretical framework and literature review. Section three gives information about the research methodology. Section four deals with empirical results and discussion. Section five covers the summary of findings, policy implications and policy recommendations.

## **2. THEORETICAL FRAME WORK AND LITERATURE REVIEW**

### **2.1 Theoretical Framework**

Keynesian Theory of Public Expenditure.

The General Theory of Employment, Interest, and Money, was published in 1936. The publication constituted an enormous attack on the classical economics tradition in which Keynes was brought up. The time that had sustained classical economics had been shattered by the First World War, and for Keynes the cataclysms since had confirmed the inadequacies of the classical ideology. Obviously a new fusion was essential, and that is what Keynes wanted to establish as he maintained that classical economics rested on a primary blunder

assuming, erroneously, that the equilibrium between supply and demand would ensure full employment in the economy. However, in Keynes's opinion, the economy was constantly unsteady and prone to fluctuations, and supply and demand could well balance out at an equilibrium that did not deliver full employment in the economy due to poor investment and over-saving, both entrenched in the psychology of vagueness in the economy.

Keynes maintained that the solution to this issue was ostensibly straightforward by replacing the lost private investment with public investment, financed by conscious budget deficits in the economy. Keynes believes that government should borrow money to spend on such things as public works; and that deficit spending, in turn, would create jobs and increase purchasing power in the economy as striving to balance the government's budget during a recession would make things worse, not better. Keynes subsequently adopted a variety of fresh tools—standardized national income accounting, the theory of aggregate demand, and the multiplier (people getting government funds for public-works jobs will spend money, which will generate fresh jobs) in the economy. Keynes's theory laid the foundation for the field of macroeconomics which treats the economy as a whole and focuses on government's use of fiscal policy spending, deficits and tax in overall economic management. Such tools Keynes argued could be applied to manage aggregate demand and thus ensure full employment in the economy. As a consequence, the government would cut back its spending during times of recovery and expansion in the economy.

Keynes proposed government to play a much larger role in the economy and his vision was one of renewed capitalism, managed capitalism—capitalism saved both from socialism and from itself. Keynes canvassed for an inclusive socialization of investment" and the state's taking "an ever better accountability for openly organizing investment in the economy." He contends that fiscal policy would allow prudent managers to stabilize the economy without resorting to actual controls then bulk of decision making would remain with the decentralized market rather than with the central planner in the economy.

### **2.1.1 James Buchanan theory of debt**

Buchanan debt theory states that public principle of public debt is universally associated with the

claim that debt allows the cost of public activity to be shifted onto future generations. This claim treats a generation as a unitary and acting entity. Buchanan's starting point in his investigation of public-debt finance is a consideration of its incidence. As he frames the question, who pays for public debt, and when do they pay? His answer is that public debt constitutes a burden on future taxpayers: The essence of public debt, as a financing institution, is that it allows the objective cost of currently financed expenditure projects to be postponed in time. For the tax payer, public debt delays the necessity of transferring command over resource services to the treasury. Buchanan points out that bond holders lend voluntarily by choosing from among multiple investment opportunities, and in the future they receive back their invested principal plus interest. The voluntary nature of their lending shows that it makes them better off instead of worse off, so bond holders are clearly not the ones bearing the burden of government debt.

He draws a distinction between subjective and objective costs, arguing that the voter-taxpayer's conception of the cost of debt is based on his subjective evaluation of forgone alternatives at the moment of choice, rather than on the objective effect of future cash flows of interest and principal: 'Cost or burden' remains meaningless until and unless it can be translated into effects on some persons in the group at some time. The objective cost is the actual "burden" of debt—namely, the value of resources sacrificed by future taxpayers. The decision to incur debt, however, is made by present taxpayers, based on an evaluation of the subjective cost to them, which is negligible in the case of public debt. As Buchanan himself points out, he was not the first to advance this view. He credits classical economists such as Henry C. Adams, Charles F. Bastable, and especially Paul Leroy-Beaulieu. At the time that he wrote *Public Principles of Public Debt*, however, these writers' ideas had been abandoned and replaced by the idea that the burden of public debt is born by present rather than future generations because "we owe it to ourselves" [10]. Buchanan counters that in this statement "we" should be disaggregated into present-day people in their capacities as taxpayers and bondholders.

### **2.1.2 Debt overhang theory**

The term "debt overhang" originated in the corporate finance literature and indicates a

situation in which a firm's debt is so large that any earnings generated by new investment projects are entirely appropriated by existing debt holders, even projects with a positive net present value cannot reduce the firm's stock of debt or increase the value of the firm [11]. The concept of debt overhang migrated to the international finance literature in the mid-1980s, when the debt crisis motivated a series of influential papers by [12,13]. These authors argued that, as sovereign governments service their debt by taxing firms and households, high levels of debt imply an increase in the private sector's expected future tax burden. Debt overhang characterizes a situation in which this future debt burden is perceived to be so high that it acts as a disincentive to current investment, as investors think that the proceeds of any new project will be taxed away to service the pre-existing debt. Lower levels of current investment, in turn, lead to lower growth and, for a given tax rate, lower government revenues, lower ability to pay, and lower expected value of the debt. Countries that suffer from debt overhang will have no net resource flows because, by definition, any new loan that might be issued would be worth less than its nominal value, and no new creditor will be willing to lend when a loss is certain. Countries that suffer from debt overhang may be located on the wrong side of the "Debt Laffer curve" which is characterized by a situation in which partial debt cancellation that reduces the expected tax burden can make both lenders and borrowers better off by increasing investment and growth and thus tax revenues and the value of debt. Even if creditors could be better off by canceling debt, debt cancellation requires a coordination mechanism that forces all creditors to accept some nominal losses. In the absence of such a coordination mechanism, each individual creditor will prefer to hold out while other creditors cancel part of their claims.

## 2.2 Empirical Literature

The empirical literature has found mixed support for the debt overhang supposition. Most models of the determinants of growth have presumed that the stock of debt affects growth both directly (by reducing a government's incentives to undertake structural reforms) and indirectly (by dampening investment and by extension reducing employment creation). But relatively few studies have assessed the direct effects of the debt stock on investment in low-income countries econometrically. And few studies have been able to determine how large the stock of public debt

has to be, relative to GDP, for the debt overhang to have an effect.

[14] undertook an analysis of the long-run relationship and impact of debt from the perspective of the value impact and proportional impact on the Nigeria economy. The value impact variables used include the external debt value, domestic debt value, total debt value and budget deficit. The result showed that the joint impact of debt on economic growth is negative and quite significant in the long-run though in the short-run the impact of borrowed funds and coefficient of budget deficit is positive. The study concluded that though in the short-run the impact of borrowed fund on the Nigerian economy was positive, the impact of debt in the long-run depressed economic growth as a result of incompetent debt management.

[15] investigated the relationship between domestic debt and economic growth in Nigeria. The result shows that domestic debt has affected the growth of the economy negatively. The study recommended that Government domestic borrowing should be discouraged and that increasing the revenue base through its tax reform programmes should be encouraged.

[16] studied the impact of external debt on economic growth of Nigeria. In view of the negative contribution of external debt to economic growth, the study recommended that cost-benefit analysis, prioritization of projects, absorptive capacity of the economy, investment on productive self-financing projects, probity as well as accountability in handling government resources and debt sustainability should form the basis for contracting external debt finance.

[17] examined external debt burden and its impact on major macro economic variables in Nigeria. The econometric method of co integration technique was applied to establish the quantitative impact and relative significance of the explanatory variables. The study shows that there exists a long run relationship among the major macro economic variables. The results show that external debt burden, foreign direct investment, inflation and export have a positive relationship with economic growth. The study recommends that the Nigerian government should not contract further unproductive debt as it is detrimental to the growth and development of the economy.

[18] examined the causal relationship between public debt and economic growth in Nigeria

between 1970 and 2010 using a Vector Autoregressive (VAR). Co-integration test was also performed and the result revealed the presence of co-integration between public debt and economic growth. The co-integration results show that public debt and economic growth have long run relationship. The findings of the VAR model revealed that there is a bi-directional causality between public debt and economic growth in Nigeria. The paper concluded that public debt and economic growth has long run relationship, and they are positively related if the government is sincere with the loan obtained and use it for the development of the economy rather than channel the funds to their personal benefit.

[19] investigated the potency of both external and domestic debts on the performance of the Nigerian economy with emphasis on which of the debt type exert more influence on the major macroeconomic variables of per capita GDP and gross domestic investment. The results show that, real exchange rate is a positive and significant determinant of economic growth; Interest rate is a negative and significant determinant of domestic investment in Nigeria. The study concludes that government should have recourse to domestic market-based borrowing in order to help mobilize domestic saving and stimulate domestic investment in Nigeria.

[20] opines that public debt is one of the main macroeconomic indicators, which forms countries' image in international markets. It is one of the inward foreign direct investment flow determinants. A prudent public debt management helps economic growth and stability through mobilizing resources with low borrowing cost and limiting financial risk exposure. According to the study domestic debt is characterized by higher interest rates compared with those on external debt, which is contracted mainly on concessional terms, and it is therefore expensive to maintain. Domestic debt reduction could be achieved using proceeds from the privatization programme of public corporations, or the use of externally borrowed resources which are mainly on concessional terms to retire more expensive domestic debt. The government should therefore develop a framework for recording and monitoring all contingent liabilities and also formulate and implement a policy for management of the contingent liabilities. The government should continue to implement wider reforms that promote investment in Treasury bonds, and

encourage institutional investors such as pension funds and insurance companies to invest in Treasury bonds.

[4] explains that James Buchanan's public principles of public debt are commonly associated with the claim that debt allows the cost of public activity to be shifted onto upcoming generations. According to the study the claim treats a generation as a unitary and acting entity. While such treatment is standard fare for macro theorists who work with representative agents and societal averages in place of the individuals who constitute a society, such treatment conflicts with Buchanan's cost and choice and his entire work. The study undertakes an act of rational modernization that renders his 1958 claim both realistic and consistent with his 1969 formulation where cost can be experienced only by individuals and never by generations. This rational reconstruction reveals a cleavage between public debt approached through macro theory and public debt approached through public finance. Public Principles was generally treated by economists as macro theory when it really originated in public finance and political economy the study stressed.

### **3. DATA AND METHOD OF ANALYSIS**

#### **3.1 Data**

The data used for this study are the time series covering 1980 – 2015 period and are obtained from the statistical Bulletin of Central Bank of Nigeria (CBN), annual reports and Statement of Account of various issues and online service from – [data.worldbank.org/indicators](http://data.worldbank.org/indicators).

#### **3.2 Method of Analysis**

This paper made use of econometric procedure in estimating the relationship between the variables. The auto regressive distributed lag model was employed in obtaining the numerical estimates of the coefficients of the equation. The ARDL is used only when the variables are not co integrated of the same order. The Augmented Dickey - Fuller (ADF) and Philip perron (PP) tests were used to test the stationary of variables. Equally, bounds test co integration procedure was used to test the existence of long run equilibrium relationship among the economic variables. In demonstrating the application of ECM, the multiple linear regression analysis was used where unemployment rate, growth rate of gross domestic product, inflation rate and public

debt (domestic and external) were the relevant variables. Unemployment rate was used as the dependent variable while the growth rate of gross domestic product, inflation rate and public debt were the independent variable. The selection of this method was justified because the data were time series and all time series data exhibits a random walk.

### 3.3 Estimation Procedure

#### 3.3.1 Unit root

The simple unit root model can be specified as:

$$DY_t = \alpha + bt + \theta Y_{t-1} + \mu t \quad (1)$$

$$\Delta \hat{U}_t = \delta \hat{U}_{t-1} + \sum_{j=1}^p Y_i \Delta \hat{U}_{t-1} + \epsilon_t \quad (2)$$

In order to complete the unit root test using the Augmented Dickey-Fuller (ADF) test, the regression equation with the inclusion of a constant is introduced as:

$$\Delta X_t = \beta_0 + \beta_1 X_{t-1} + \sum_{j=1}^{\Omega} \beta_j \Delta X_{t-j} + \epsilon_t \quad (3)$$

Where  $\Delta X_t = X_t - X_{t-1}$  and  $X$  is the variable under consideration,  $\Omega$  is the number of lags in the dependent variable and  $\xi_t$  is the stochastic error term. The stationarity of the variable is tested using the null hypothesis of  $|\beta_1| = 1$  against the alternative hypothesis of  $|\beta_1| < 1$ . The critical value of ADF statistic as reported in [21] can be used to test this hypothesis. If the null hypothesis cannot be rejected, it implies that the time series is non-stationary at the level and therefore it requires taking first or higher order differencing of the level data to establish stationarity. [22] prefer the ADF test due to stability of its critical values as well as its power

$$\Delta \ln UNEM_t = \theta_0 + g\delta t - 1 + \sum \theta_{ij} \beta_{ij} \Delta \ln UNEM_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln LPD_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln GGDPT_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln INF_{t-j} + \epsilon_t \quad (5)$$

$$\Delta \ln LPD_t = \theta_0 + g\delta t - 1 + \sum \theta_{ij} \beta_{ij} \Delta \ln LPD_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln UNEM_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln GGDPT_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln INF_{t-j} + \epsilon_t \quad (6)$$

$$\Delta \ln GGDPT_t = \theta_0 + g\delta t - 1 + \sum \theta_{ij} \beta_{ij} \Delta \ln GGDPT_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln LPD_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln UNEM_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln INF_{t-j} + \epsilon_t \quad (7)$$

$$\Delta \ln INF_t = \theta_0 + g\delta t - 1 + \sum \theta_{ij} \beta_{ij} \Delta \ln INF_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln LPD_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln GGDPT_{t-j} + \sum \theta_{ij} \beta_{ij} \Delta \ln UNEM_{t-j} + \epsilon_t \quad (8)$$

Where  $\delta_{t-1}$  are the error correction terms.

over different sampling experiments. The optimum lag length ( $\Omega$ ) in the ADF regression is selected using the minimum final prediction error (FPE) criterion developed by Akaike and then the results were confirmed by the Schwarz criterion.

#### 3.3.2 ARDL bound test co integration

In order to empirically analyze the long-run relationships and short run dynamic interactions among the variables of interest (Unemployment, public debt, inflation and growth rate of GDP), we apply the autoregressive distributed lag (ARDL) co integration technique as a general vector autoregressive (V AR) model of order  $p$ , in  $Z_t$ , where  $Z_t$  is a column vector composed of the five variables:  $Z_t = (Y, K, L, Ft, Ti)$ . The ARDL Bounds Testing methodology developed by [23] and [24] has a number of features over conventional co integration testing which includes; a mixture of  $I(0)$  and  $I(1)$  data, a single-equation set-up, making it simple to implement and interpret and assignment of different lag-lengths to different variables as they enter the mode [25]. A typical ARDL model can be stated thus;

$$\gamma_t = \beta_0 + \beta_1 \gamma_{t-1} + \dots + \beta_p \gamma_{t-p} + \alpha_0 X_{t-1} + \alpha_1 X_{t-2} + \dots + \alpha_q X_{t-q} + \epsilon_t \quad (4)$$

where  $\epsilon_t$  is a random "disturbance" term, which we'll assume is "well-behaved" in the usual sense and serially independent.

#### 3.3.3 Error correction model

The error correction mechanism (ECM), presupposes that some variable  $y$  has an equilibrium path. If the variables are co integrated, there must exist an error-correction representation that may take the following form:



### 3.3.4 Granger causality model

In the short-run, there are adjustments to deviations from the long-run path which are defined by Long-run causality. Short-run causality is ascertained by a test on the joint significance of the lagged explanatory variable. The study tries to find the causality direction between the two variables, stock market development and economic growth by using Granger type causality methodology, i.e., standard Granger causality test [26,27]. The test relies on estimating two basic equations as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^n \alpha_i Y_{t-i} + \sum_{j=1}^n \beta_j X_{t-j} + \varepsilon_{1t} \quad (9)$$

$$X_t = \lambda_0 + \sum_{i=1}^n \lambda_i Y_{t-i} + \sum_{j=1}^n \theta_j X_{t-j} + \varepsilon_{2t} \quad (10)$$

## 4. EMPIRICAL RESULTS AND DISCUSSION

### 4.1 Unit Root Test

The Augmented Dickey-Fuller (ADF) and Philip Perron formula were employed to test for the existence of unit roots in the data using trend and intercept. The test results are presented below in Table 1.

Considering the variables at 5% level of significance, GGDP was stationary at level i.e.

$$\Delta y_t = \beta_0 + \sum \beta_i \Delta y_{t-i} + \sum \gamma_j \Delta x_{1t-j} + \sum \delta_k \Delta x_{2t-k} + \theta_0 y_{t-1} + \theta_1 x_{1t-1} + \theta_2 x_{2t-1} + e_t \quad (17)$$

Using equation (13) above in the E views estimation, it becomes:

$$\begin{matrix} D(\text{UNEM}) & c & D(\text{UNEM}(-1)) & D(\text{UNEM}(-2)) & D(\text{LPD}(-1)) & D(\text{LPD}(-2)) & D(\text{GGDP}(-1)) & D(\text{GGDP}(-2)) \\ & & D(\text{INF}(-1)) & D(\text{INF}(-2)) & \text{UNEM}(-1) & \text{PD}(-1) & \text{GGDP}(-1) & \text{INF}(-1) \end{matrix} \quad (18)$$

Where all variables are as previously defined in 3.4 above, D is the first difference, and lag length 2 is chosen due to the obtained lowest AIC and SIC values.

### 4.2.1 Diagnostic tests

The validity of the regression for the underlying ARDL equation was tested against serial correlation (Breusch-Godfrey test) and stability of the model using cumulative sum of recursive residuals (CUSUM) as shown in Table 3 and Fig. 1, so as to assess the parameter stability [29].

I(0) while others (UNEM, LPD and INF) are not stationary at levels 1(0). However, at first difference UNEM, LPD and INF became stationary I(1). The results show that in the first instance the series (GGDP) is integrated of order zero I(0) while others are integrated of order one I(1), both with ADF and Philip Perron, thus, ARDL Model otherwise known as Bound test is employed.

### 4.2 ARDL Bounds Tests for Co Integration

In order to empirically analyze the long-run relationships and short run dynamic interactions among the variables of interest (Unemployment Growth Rate (UNEM), Public Debt (LPD), Growth rate of Gross Domestic Product (GGDP), and Inflation Rate (INF)) we apply the autoregressive distributed lag (ARDL) co integration technique as shown in Table 2.

The ARDL co integration approach was developed by [23,24]. It has three advantages in comparison with other previous and traditional co integration methods. The first one is that the ARDL does not need all the variables under study to be integrated of the same order and it can be applied when the under-lying variables are integrated of order one, order zero or fractionally integrated. The second advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The last and third advantage is that by applying the ARDL technique we obtain unbiased estimates of the long-run model [28]. The ARDL model used in this study is expressed as follows:

**Table 1. ADF and Philip perron tests**

ADF statistics variables	INF	UNEM	LPD	GGDP
@ Level (PV)	-3.122014 (0.1171)	-2.266641 (0.4401)	-2.559275 (0.2999)	-5.642361 (0.0003)
5% crit. val	-3.544284	-3.544284	-3.544284	-3.544284
10% crit. val	-3.204699	-3.204699	-3.204699	-3.204699
Rmks	NS	NS	NS	Stationary
@ 1 <sup>st</sup> df (PV)	-5.657072 (0.0003)	-5.261348 (0.0006)	-7.142198 (0.0000)	-
5% crit. val	-3.548490	-3.548490	-3.548490	-
10% crit. val	-3.207094	-3.207094	-3.207094	-
Rmks	Stationary	Stationary	Stationary	-
PP statistics variables	INF	UNEM	LPD	GGDP
@ Level (PV)	3.010107 (0.1439)	-2.266641 (0.4401)	-2.717507 (0.2361)	-5.643720 (0.0003)
5% crit. val	3.544284	3.544284	3.544284	3.544284
10% crit. val	3.204699	3.204699	3.204699	3.204699
Rmks	NS	NS	NS	Stationary
@ 1 <sup>st</sup> df (PV)	11.19917 (0.0000)	-5.333600 (0.0006)	-7.362321 (0.0000)	-
5% crit. Val	-3.548490	-3.548490	3.548490	-
10% crit. Val	-3.207094	3.207094	-3.207094	-
Rmks	Stationary	Stationary	Stationary	-

Sources: Researcher's computation using E-view (version 7.0)

**Table 2. ARDL long-run relationships test**

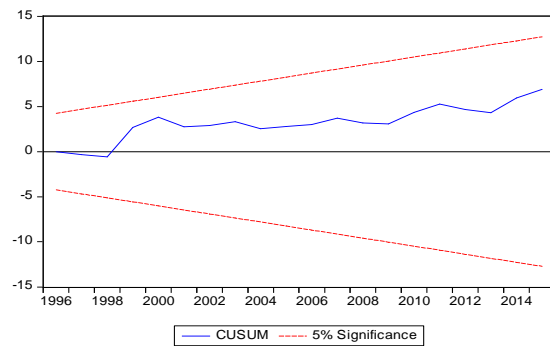
Variable	Coefficient	Std. error	t-statistic	Prob.
C	-9.015126	4.528377	-1.990807	0.0603
D(UNEM(-1))	0.087209	0.168121	0.518726	0.6096
D(UNEM(-2))	-0.191667	0.164851	-1.162667	0.2587
D(LPDP(-1))	-1.871292	0.530057	-3.530361	0.0021
D(LPDP(-2))	-0.192835	0.550856	-0.350065	0.7299
D(GGDP(-1))	0.092684	0.107822	0.859598	0.4002
D(GGDP(-2))	0.049808	0.072795	0.684218	0.5017
D(INF(-1))	0.109828	0.046888	2.342356	0.0296
D(INF(-2))	0.058821	0.050030	1.175724	0.2535
UNEM(-1)	-0.688378	0.200860	-3.427150	0.0027
LPD(-1)	1.617786	0.491403	3.292180	0.0036
GGDP(-1)	-0.125606	0.140380	-0.894762	0.3816
INF(-1)	-0.186605	0.063273	-2.949229	0.0079

$R^2 = 0.692045$ ,  $F$ -Statistics = 3.75,  $Prob(F$ -Statistics) = 0.005,  $DW = 1.86$

**Table 3. Breusch-godfrey serial correlation LM test**

F-statistic	0.260757	Prob. F(2,18)	0.7733
Obs*R-squared	0.929188	Prob. Chi-Square(2)	0.6284

The Observed R-squared from Table 3 above is 0.93 while its P-value is 0.63. The P-value is greater than the chosen level of significance [0.05], therefore we accept the null hypothesis. This implies that this model does not have serial correlation.



**Fig. 1. CUSUM test for ARDL**

The blue line in Fig. 1 is within the two critical lines. This implies that the model is stable.

The bounds test is mainly based on the joint F-statistic which its asymptotic distribution is non-standard under the null hypothesis of no co integration. The first step in the ARDL bounds approach is to estimate the equations by ordinary least squares (OLS).

The estimation of the equation test for the existence of a long-run relationship among the variables was conducted by employing an F-test for the joint significance of the coefficients of the lagged levels of the variables, i.e., :  $H_0: C(10) = C(11) = C(12) = C(13) = 0$  against the alternative one :  $H_1: C(10) \neq C(11) \neq C(12) \neq C(13) \neq 0$  for  $C(10)$ ,  $C(11)$ ,  $C(12)$  and  $C(13)$  are  $UNEM(-1)$ ,  $LPD(-1)$ ,  $GGDP(-1)$  and  $INF(-1)$  respectively. We denote the F-statistic of the test which normalize on

$$UNEM = f(UNEM, LPD, GGDP, INF) \quad (19)$$

**4.2.2 Wald test**

Based on Table 4, the F-statistic value is 3.67. We compare the F-statistic value with the two sets of critical values for a given significance level [24]. The first level is calculated on the basis that GGDP included in the ARDL model is integrated of order zero, while other variables are calculated on the basis that the variables are integrated of order one. Using the Pesaran Critical value at 5% level with restricted intercept and no trend, the lower boundary is 2.79 while the upper bound is 3.67. The null hypothesis of no co integration is rejected since the value of the F- statistic [3.673] exceeds the upper critical bounds value.

From these results, it is clear that there is a long run relationship amongst the variables when *UNEM* is the dependent variable because its F-statistic (3.673) is higher than the upper-bound critical value (3.67) at the 5% level. This implies that the null hypothesis of no co integration among the variables is rejected. This means that all the three variables (*UNEM*, *LPD*, *GGDP* and *INF*) move together in the long run.

**4.3 ECM**

To capture the speed of the adjustment to the long run equilibrium, ECM is estimated, as shown in Table 5.

From Table 6, the F-statistic is 0.37 while its P-value is 0.69. Since the P-value is greater than 0.05, we cannot reject the null hypothesis. This means that there is no serial correlation in the model.

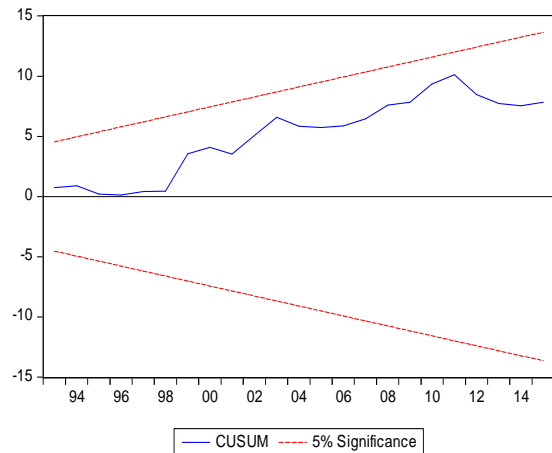
**4.3.1 Stability test**

In order to ascertain if the model is stable for analysis, CUSUM test is conducted as shown in Fig. 2.

It is observed from Fig. 2 above that the blue line is within the critical lines. Thus, it is an indication that the error correction model is stable. Having ascertained that ECM does not have serial correlation and stable, it is a good model. The model is desirable for estimation.

**Table 4. Wald test for co integration**

Test statistic	Value	Df	Probability
F-statistic	3.672599	(4, 20)	0.0212
Chi-square	14.69040	4	0.0054



**Fig. 2. Cusum test for ECM**

**4.4 Checking for Short Run Causality from Independent Variables to Dependent Variable**

Considering coefficients, i.e.  $C(4)$  and  $C(5)$  which is the coefficient of Public debt (*LPD*), the F-statistic is 6.91 while its P-value is 0.0045. Since the P-value (0.0045) is less than the chosen level of significance (0.05), the null hypothesis is rejected. This means that there is short run causality running from *LPD* to *UNEM*.

**Table 5. Error Correction Model (ECM)**

Variable	Coefficient	Std. error	t-statistic	Prob.
C	0.166867	0.523488	0.318761	0.7528
D(UNEM(-1))	0.292830	0.154641	1.893612	0.0709
D(UNEM(-2))	-0.133672	0.174943	-0.764092	0.4526
D(LPD(-1))	-0.897935	0.447792	-2.005248	0.0568
D(LPD(-2))	0.750207	0.492595	1.522969	0.1414
D(GGDP(-1))	-0.008453	0.074419	-0.113584	0.9106
D(GGDP(-2))	-0.022979	0.061200	-0.375471	0.7108
D(INF(-1))	0.045739	0.039850	1.147792	0.2629
D(INF(-2))	-0.012865	0.042222	-0.304698	0.7633
ECT(-1)	-0.422595	0.193174	-2.187640	0.0391

$R^2 = 0.557847$ ,  $F$ -Statistics = 3.22, Prob ( $F$ -Statistics) = 0.01,  $DW = 1.99$

**Table 6. Serial correlation of ECM**

<b>Breusch-godfrey serial correlation LM test:</b>			
F-statistic	0.372076	Prob. F(2,21)	0.6938
Obs*R-squared	1.129361	Prob. Chi-Square(2)	0.5685

Considering coefficients i.e. C(6) and C(7) which is the coefficient of growth rate of Gross domestic product (GGDP), the F-statistic is 0.07 while its P-value is 0.9313. Since the P-value (0.9313) is greater than the chosen level of significance (0.05), the null hypothesis is accepted. This means there is no short run causality running from GGDP to UNEM.

**Table 7. Public debt and unemployment (short run causality)**

<b>Equation: Untitled</b>			
Test statistic	Value	Df	Probability
F-statistic	6.906547	(2, 23)	0.0045
Chi-square	13.81309	2	0.0010
Null Hypothesis: C(4)=C(5)=0			

**Table 8. GGDP/UNEM causality**

<b>Wald test:</b>			
<b>Equation: Untitled</b>			
Test statistic	Value	Df	Probability
F-statistic	0.071394	(2, 23)	0.9313
Chi-square	0.142789	2	0.9311
Null Hypothesis: C(6)=C(7)=0			

**Table 9. Causality for INF/UNEM**

<b>Wald test:</b>			
<b>Equation: Untitled</b>			
Test statistic	Value	Df	Probability
F-statistic	0.817684	(2, 23)	0.4539
Chi-square	1.635368	2	0.4415
Null Hypothesis: C(8)=C(9)=0			

Considering coefficients i.e. C(8) and C(9) which is the coefficient of inflation (INF), the F-statistic is 0.82 while its P-value is 0.4539. Since the P-value (0.4539) is greater than the chosen level of significance (0.05), the null hypothesis is accepted. This means there is no short run causality running from INF to UNEM.

#### **4.4.1 Implication of the results**

The result indicated that in the short run, only public debt (LPD) influenced the unemployment rate significantly in Nigeria within the period under study while other variables do not affect the unemployment rate in the short run. This is confirmed by the Wald test on ECM. However, using the Pesaran Critical value at 5% level with restricted intercept and no trend, the lower boundary is 2.79 while the upper bound is 3.67. The null hypothesis of no co integration is rejected since the value of the F-statics statistic [3.673] exceeds the upper critical bounds value. From these results, it is clear that there is a long run relationship amongst the variables. Therefore, there is significant long run relationship between unemployment and the explanatory variables such as public debt, GDP growth rate and inflation rate in Nigeria within the period under study. Thus, public debt (LPD) affects unemployment rate significantly in the long run. This finding agrees with [17,18] who reported long run equilibrium relationship between public debt and economic growth in Nigeria. It is estimated from the ARDL long run test that 1% increase in public debt on the average, will bring about 1.6% increase in

unemployment rate (UNEMP). This confirms that in Nigeria, the more government incurs more debt (public debt increases), unemployment rate rises. This finding agrees with the findings in [14] [15,16] who reported negative impact of public debt on economic growth. Also, the result from the ARDL long run test reveals that 1% increase in GDP growth rate on the average will bring about 0.12% decrease in unemployment rate (UNEMP). It implies that as the economy grows (GDP increases), it will cause unemployment rate to fall. On the other hand, it was found that 1% increase in inflation rate will bring about 0.2% decrease in unemployment. In this case, the a priori sign is not met. However, a situation where persistence increase in the general price level is backed up by continuous rise in the per capita income, the effect from high inflation will be reduced, thereby reducing unemployment rate.

In the ECM, it was found that the ECT is -0.423 and its P-value is 0.0391. The Error Correction Term (ECT) is fractional, negative and significant. Thus, the conditions for ECM are met. The speed of adjustment is 42.3%. This implies that the whole system of the model correct its previous disequilibrium by 42.3% annually. Thus, there is system correction of disequilibrium to long run equilibrium.

## 5. SUMMARY OF FINDINGS, POLICY IMPLICATION AND RECOMMENDATION

This paper examined the implications of rising public debt profile on unemployment in Nigeria from 1980-2015. The result of the co integration test show a long run relationship among the variables in the model. This finding agrees with [17,18] who reported long run equilibrium relationship between public debt and economic growth in Nigeria.

The error correction term is negatively signed and statistically significant. It is estimated from the ARDL long run test that 1% increase in public debt on the average, will bring about 1.6% increase in unemployment rate (UNEM). This confirms that in Nigeria, the more government incurs more debt (public debt increases), unemployment rate rises. This finding agrees with the findings in [14-16] who reported negative impact of public debt on economic growth. It is the opinion of this study that if increase in public debt has negative impact on economic growth

according to the above studies such negative impact will also affect employment creation negatively thereby increasing unemployment rate in the economy. The result from the ARDL long run test reveals that 1% increase in GDP growth rate on the average, will bring about 0.12% decrease in unemployment rate (UNEMP). It implies that as the economy grows (GDP increases), it will cause unemployment rate to fall. On the other hand, it was found that 1% increase in inflation rate will bring about 0.2% decrease in unemployment. The causality test indicates that causality runs from public debt to unemployment.

## 6. CONCLUSION

The study therefore, concludes that public borrowing in Nigeria has not created its desired impact in the economy; hence, the increase in public debt has not reduced unemployment. Also, rapid increasing debt service obligations constitute an obstacle to the implementation of new development oriented projects therefore worsening unemployment situation since a proportion of revenue for this purpose is set aside for servicing previous debts. It is pertinent to note that this obvious problem is attributed to level of corruption prevalent in the economy, government pattern of spending and diversion of the borrowed fund to unproductive or non investment oriented projects which should in turn create employment. To this effect, the study makes the following recommendations: firstly, that public borrowing should strictly be for capital projects that have the capacity to create jobs only. Secondly, economic sector projects should have positive internal rate of return as high as the cost of borrowing. Thirdly, external loans for public sector projects with quick returns should be sourced from the international capital market while loans for social services could be sourced from concessional financial institutions. More so, the government should imbibe high level of transparency in public expenditure and procurement process. Finally, over bearing domestic borrowing should be discouraged as these crowds out private sector investment and consequently compounds our unemployment issues since the government naturally cannot compete with the private sector.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. John C. Anyanwu. Nigerian public finance. Joanee Educational Publishers Ltd, 51, Awka Road, P.O.Box 2791, Onitsha, Anambra; 1997.
2. Anyanwu JC. Monetary economics, theory, policy and institutions. Hybrid Publishers Ltd, Onitsha; 1993.
3. Buchanan James M. Public principles of public debt: A defense and restatement of the collected works of james buchanan. Indianapolis, Ind: Liberty Fund. 1999;2(82): 126.
4. Wagner RE. Deficit, debt and democracy: Wrestling with tragedy on the fiscal commons. Cheltenham, UK: Edward Elgar; 2012.
5. Akinboyo. The impact of unemployment on the economic growth of Nigeria; 1987. Available:<http://www.accademia.edu/8506667/>
6. Raheem MI. Assessing and managing external debt problems in Nigeria. World Development. 1994;22(8):1223-1242.
7. Financial Nigeria. Development and Finance; 2016.
8. Debt Management Office, first Quarterly report for the year; 2016.
9. Central Bank of Nigeria Statistical Bulletin; 2015.
10. Lerner AP. Functional finance and the federal debt. Social Research. 1943; 10(1):38-51.
11. Myers SC. Determinants of corporate borrowing. Journal of Financial Economics. 5:147-175.
12. Krugman P. Financing overhang: Some analytical notes. Journal of Development Economics. 1988;29:253-268. Available:<http://dx.doi.org/10.1016/0304-3878>
13. Sachs JD. The debt overhang of developing countries. In de Macedo JB, Findlay R (eds). Debt, growth and stabilization: Essay in memory of Carlos F. Diaz Alejandro: Oxford and Cambridge, MA: Blackwell. 80-102.
14. Obademi Emmanuel O. An empirical analysis of the impact of public debt on economic growth: Evidence from Nigeria Canadian social science. 2012;8(4):154-161. ISSN 1923 – 6697.
15. Adofu, Abula M. Domestic debt and the Nigeria economy. Current Research Journal of Economic Theory. 2010;2(1):22-26.
16. Obademi Olalekan Emmanuel. External debt and Nigeria economic growth nexus: matters arising. Journal of Poverty, Investment and Development – An open Access International Journal. 2013;1.
17. Oyowwi Dickson O. External debt burden and its impact on growth: An assignment of major macroeconomic variables in Nigeria. Academic Journal, Interdisciplinary studies. 2013;2(2). ISSN 2281-3993
18. Tajadeen Egbetunde. Public debt and economic growth in Nigeria: Evidence from granger causality. America Journal of Economics. 2012;2(6):101-106.
19. Ebi Bassey O, Abu Maji, Clement O. Denis. The relative potency of external and domestic debts on economic performance in Nigeria. European Journal of Humanities and Social Sciences. 2013;27:1.
20. Christabell Matiti. The relationship between public debt and economic growth in Kenya. International Journal of Social Science and Project Planning Management. 2013;1:1.
21. Robert Engle, Byung Sam Yoo. Forecasting and testing in co integrated systems. Journal of Economics. 1987; 35(1):143-159.
22. Engle RF, Granger CWJ. Co integration and error correction: Representation, estimation and testing. Econometrical. 1987;55:251-276.
23. Pesaran MH, Shin Y. an auto regressive distributed lag modeling approach to co integration analysis. In storm S. (ed). Econometrics and Economic theory in the 20<sup>th</sup> century: The Ragnarfrisch. Cambridge, UK: Cambridge University press; 1999.
24. Pesaran MH, Shin Y, Smith RJ. Bounds testing approaches to the analysis of level relationship. Journal of Applied Econometrics. 2001;16;289-326.
25. Dave Giles. National debt and Regression models. Unit of Measurement Matter, Econometrics Beat: Dave Giles Blog.
26. Granger CWJ. Investigating causal relations by econometric models and cross

- spectral methods. *Econometrica*. 1969; 28. 37(3):424-438.
27. Banerjee Saumya S, Saibal Ghosh. Demand following and supply leading relationships: An empirical analysis for India. Published in: *Indian Journal of Economics*. 1998;1:67-82.
28. Harris R, Sollis R. *Applied time serie modeling and forecasting*. Wiley, West Sussex.
29. Pesaran MH, Pesaran B. *Working with microfit 4.0: Interactive econometric analysis*. Oxford University press: Oxford; 1997.

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