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PUBLIC DEBT AND ECONOMIC GROWTH NEXUS IN INDIA: AN EMPIRICAL INVESTIGATION

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ABSTRACT
Many countries, particularly developing nations have continued to witness increasing debt profile since the world economic recession of 2007; the Indian case is not an exception. The nature of effect the increasing debt profile has on the economic growth of India forms the crux of this study. The study employed the Augmented Dickey Fuller (ADF) test for unit root to test stationarity of the data, and all the variables were found to be integrated of order one. Johansen cointegration test was applied to examine whether the variables are cointegrated or not, findings of the test show the presence of long run association between the variables. The Vector Error Correction Model (VECM) was employed to examine the long run and short run relationship among the variables. Long run estimates showed the presence of a positive and significant relationship between Internal Debt, external Debt and Investment with GDP, while the relationship between Debt Servicing and GDP was found to be significantly negative. In the short run, Internal Debt, External Debt and Debt Servicing exhibited a negative impact on GDP, while Investment was found to be having a positive relationship with GDP.

KEYWORDS
public debt, economic growth, india.

JEL CLASSIFICATION
H63, O43, E22, C22.

INTRODUCTION
Many Economists have tried to investigate the effect of public debt on economic growth. The researchers used different data sets, methods and techniques to check the nature of relationship between external debt and economic growth. Some researchers concluded that there is a positive effect of public debt on economic growth as public debt gives a boost to the economy where as some concluded a negative relationship between external debt and economic growth because of the inefficient allocation of the resources (Rabia and Kamaran, 2012). Many countries around the world have continued to witness a rising public debt profile. The financial crisis which erupted in 2007 and intensified in 2008, and the ensuing economic recession had an adverse effect on public finances and this led to increase in the debt profile of most of the affected countries (Nautet and Meensel, 2013). India's case is not an exception; it has also continued to witness an increase in nominal terms of its public debt structure. Public debt can be seen as a two-edged sword, when used wisely; it clearly improves growth, but if used imprudently and in excess, the resultant effect can be critical (Cecchetti et al, 2011). In developing countries, external debt forms main part of the public debt structure. Of recent, many developing countries have changed their debt structure by adopting the policies to substitute external debt with domestically issued debt (Rabia and Kamaran, 2012). Although studies such as (Folorunso and Felix, 2008) as well as (Rabia and Kamaran, 2012) found the relationship between public debt and economic growth to be negative, studies such as (Ugo and Adrea, 2013) found the relationship to be non-monotone. It is on this end that the study carried out an empirical analysis of the impact of public debt on the economic growth of India.

OBJECTIVES
The objectives of the study are to:
1. Determine the impact of public debt on economic growth of India.
2. To examine the relationship between the components of public debt and economic growth of India

LITERATURE REVIEW
Rabia and Kamaran (2012) in their study on the impact of domestic and external debt on economic growth of Pakistan found an inverse relationship between the debt and economic growth. Their findings posit that external debt amount slows down economic growth more as compared to domestic debt.
Criatina and Philipp (2010) examined the impact of government debt on per-capita GDP growth in twelve euro area countries for a period of 40 years. Their result shows a non-linear impact of debt on growth. Negative growth impact was found to when debt is around 70-80 percent of GDP.
Nauteet and Meensel (2013) categorized the impact of public debt on GDP into the short run and long run impact. Their result showed the existence of a negative but very small impact in the short run, but in the long run; the impact was found to be positive through the multiplier effect.
Cecchetti et al. (2011) sees the impact of debt at the moderate level as a catalyst which enhances growth and improve welfare. Their findings reveal that beyond a threshold level, in the case of government debt 85 percent, debt is a drag on growth.
Ugo and Andrea (2013) opined that most literatures do not provide concrete evidence that debt has an effect on economic growth. They further asserted that a growth in debt might not necessarily dampen growth, but restrictive fiscal policies by government to curb debt might reduce growth. They hence found the relationship to be monotone.

Tamoya and Felix (2012) are of the view that; financing productive government expenditure with additional debt reduces growth in the long run. This obtains whether there is high or low existing debt stock as additional borrowing not only raises current debt, but also increases debt servicing costs.

Folorunso and Felix (2008) examined the impact of external debt on economic growth of Nigeria and South Africa. Their findings reveal a negative impact of debt on economic growth, but however, external debt contributes positively to growth up to a point, after which its effect becomes negative.

Balbir and Atri (2012) found a statistically significant non-linear relationship between Public debt and growth in India, thus implying a negative impact of public debt on economic growth at higher levels. They found the threshold level of government debt–GDP ratio for India to be 61 percent.

Al-Zeaud (2014) examined the impact of public debt on the performance of the Jordanian economy using new econometric techniques that provide appropriate procedures for estimation and inference. Empirical evidence shows that population growth and public debt have played very crucial role towards economic growth in Jordan. It shows that public debt has promoted economic growth, while population growth has hindered it.

Apere (2014) in his paper on the impact of public debt on private investment in Nigeria: evidence from a non-linear model. Used the instrumental variable technique of estimation and bootstrapping technique for the computation of normal based standards errors for the turning points. The findings show that domestic borrowing has a linear and positive impact on private investment; while external debt has a u-shaped impact on private investment.

Charles (2012) in his work on "Domestic Debt and the Growth of Nigerian Economy" employed the Ordinary Least Squares method (OLS). Error correction and parsimonious models are used to analyze quarterly data between 1994 and 2008. The study affirms that the level of debt has negative effect on economic growth and also crowding out effect of private investment was found. Government should maintain a debt-bank deposit ratio below 35 percent, resort to increase use of tax revenue, to finance its deficits.

Utomi (2014) in his work on "The Impact of External Debt on Economic Growth in Nigeria" employed the Augmented Dickey Fuller (ADF) unit root test, Johansen co-integration and vector error correction techniques of estimation which provides coefficient estimates of the time-series data used in analysis. It also carries out a causality test using Granger Causality test to check for a causal relationship between external debt and economic growth in Nigeria. Findings of the study show on insignificant long run relationship and a bi-directional relationship between external debt and economic growth in Nigeria.

METHODOLOGY

The study employed the Augmented Dickey Fuller (ADF) Test for unit root, Johansen Cointegration Test, Vector Error Correction Model (Short run and Long run estimates), Short run Causality, Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD). Data on annual series of the study variables for the periods 1989 to 2014 were sourced from the Handbook of Statistics on Indian Economy (2014) and World Bank Development Indicators.

MODEL SPECIFICATION

The model is specified as:

GDP = f (ED, ID, DS, INV)

Where

GDP – Real Gross Domestic Product.

ED- External Debt.

ID – Internal Debt.

INT– Investment (GDCF).

DS – Debt Service Payment.

Note* All variables are in their log form.

Since we are running a VECM Model, the VAR(p) specification of the model is given by:

$$Y_t = C + \prod_1 Y_{t-1} + \prod_2 Y_{t-2} + \dots\dots\dots + \prod_p Y_{t-p} + \in_t \quad (1)$$

Where: Y_t is a vector of endogenous variables = $\begin{pmatrix} GDP \\ DD \\ ED \\ DS \\ INV \end{pmatrix}$

C is a vector of intercept term.

$\prod_i$ is an (n x n) coefficient matrix.

$\in_t$ is a vector of error term.

The long run cointegrating equation is specified as:

$$U_t = GDP - \alpha_0 - \beta_1 ED - \beta_2 DD - \beta_3 DS - \beta_4 INV \quad (2)$$

The Vector Error Correction Model (VECM) is specified as:

$$\Delta Y_t = C + \sum_{i=1}^{k} \Gamma \Delta Y_{t-i} + \gamma(U_{t-1}) + \varepsilon_t \quad (3)$$

Where C = Vector of Constant terms.

Y_t = Vector of Endogenous Variables.

Γ = Short run coefficient matrices.

γ = Error correction term/ speed of adjustment.

Δ = Short run operator.

U_{t-1} = One lag of long run cointegrating equation.

ε_t = Vector of error term.

FINDINGS AND DISCUSSION

STATIONARITY TEST

Owing to the fact that time series data is used, in other to avoid spurious regression, the series are first checked whether they are stationary or not. A series is said to be stationary if it is time invariant. To do this, the study employed the ADF Unit Root Test and the result is presented in Table 1.0.

TABLE 1: 0ADF UNIT ROOT TEST RESULT

Variables	Level			First Difference			Order
	None	Intercept	Int & T	None	Intercept	Int & T	
GDP	14.30	1.36	-2.37	-1.02	-3.86**	-4.09*	I(1)
ED	2.96	0.05	-1.37	-1.83	-5.22**	-5.13**	I(1)
ID	8.45	-1.04	-1.62	-1.79	-4.63**	-4.68**	I(1)
DS	-0.63	-1.59	-2.30	-5.20**	-5.12**	-5.05**	I(1)
INV	4.48	0.18	-2.47	-1.35	-6.05**	-6.19**	I(1)

Source: Author's own computation.

H0: Unit root in series. **and* denotes rejecting H0 at 1% and 5% significance respectively.

Table 1.0 presents the result of the ADF unit root test. Under the ADF test, the null hypothesis of non-stationarity (unit root) is rejected if the test statistic is more negative than the critical values. If a variable is found to be stationary in its raw form without any transformation, it is said to be integrated of order zero i.e. I(0), but of a variable only became stationary after taking its first difference, it is said to be integrated of order one. From our result above, it can be seen that all our variables were found to be stationary only after taking their first difference, we could thus conclude that all our variables are I (1).

COINTEGRATION TEST

Having examined the order of integration of our variables and all were found to be integrated of order one i.e. non-stationary, the next step in the analysis is to examine whether our variables have long run association. To do this, the study applied the Johansen cointegration test and the result is presented in table 2.0.

TABLE 2.0: JOHANSEN COINTEGRATION TEST RESULT

	TRACE TEST		MAX EIGEN VALUE TEST	
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None	122.3184*	69.81889	67.44555*	33.87687
At most 1	54.87284*	47.85613	34.26740*	27.58434
At most 2	20.60544	29.79707	16.21334	21.13162
At most 3	4.392103	15.49471	4.134853	14.26460
At most 4	0.257250	3.841466	0.257250	3.841466

Source: Author's own computation. * denotes rejection of the hypothesis at the 0.05 level

Table 2.0 presents the cointegration test result. Under the Johansen Cointegration methodology, there are basically two tests that are employed; they are the Trace test and Maximum Eigen Value test. Under each of the tests, the null hypothesis is rejected if the test statistic is greater the critical value at 5 percent level of significance. From the result presented, it can be seen that in both the test, the null hypothesis of the existence of at most one cointegration equation was rejected; we could thus conclude that in both tests there is presence of two cointegrating equations. The finding of the test points to the fact that there is long run association among the variables.

LONG RUN RELATIONSHIP ESTIMATION

After establishing the presence of long run association among the variables from the cointegration test, the next step in the analysis is to examine the long run relationship between the variables. The normalized long run relationship among the variables is presented below:

GDP = 4.92 + 0.10ID* + 0.13ED* -0.05DS* + 0.41INV* (4)

* indicates statistical significance at 5%.

Equation (4) above presents the long run relationship estimates. Since our variables are in their log form, the relationship between the variables is in its elasticity form. Internal Debt was found to have a significant positive relationship with GDP, one percent increase in Internal Debt leads to 0.10 percent increase in GDP. External Debt was also found to have a positive and significant relationship with GDP. One percent increase in External Borrowing leads to a 0.13 percent increase in GDP. However, the relationship between Debt Service Payment and GDP was found to be statistically negative. One percent inverse in Debt Service Payment leads to 0.05 percent decrease in GDP. Investment was found to have a significant positive relationship with GDP, one percent increase in Investment leads to a 0.41 percent increase in GDP. We could thus conclude that in the long run, Internal Debt, External Debt, and Investment all have a positive impact on economic growth of India, while Debt Service Payment has a negative effect on economic growth of India.

VECTOR ERROR CORRECTION MODEL

This model was estimated to retrieve the short run dynamics of the model as well as the Error Correction Term (ECT). The estimates are presented in Table 3.0

TABLE 3.0 ERROR CORRECTION REPRESENTATION

VARIABLES	COEFFICIENT	T-STATISTIC	PROB.
ECT	-0.244	-2.318	0.041*
D(ID(-1))	-0.110	-4.045	0.002**
D(ID(-2))	-0.040	-1.264	0.233
D(ED(-1))	-0.109	-4.411	0.001**
D(ED(-2))	-0.004	-0.155	0.879
D(DS(-1))	-0.055	-5.655	0.000**
D(DS(-2))	-0.027	-2.421	0.034*
D(INV(-1))	0.118	2.991	0.012*
D(INV(-12)	0.221	6.456	0.000**
C	0.124	9.681	0.000
R- Squared	0.898		
Adj R- Squared	0.795		
F- Stat.	8.78		
Prob.	0.00		

Source: Author's own computation.

*and** signifies statistical significance at 5% and 1% respectively.

From the result in Table 3.0, the presence of a stable long run relationship is further confirmed by the significant Error Correction Term (ECT). The coefficient of the ECT shows the speed of adjustment of the economy towards long run equilibrium following a shock in the economy. The result shows that following a shock in the economy, about 24 percent convergence towards long run equilibrium is completed in one year.

From the short run estimates, first lag of Internal Debt was found to have a significant negative relationship with GDP, so also is the first lag of External Debt. In the same vein, both first and second lags of Debt servicing were found to have a negative and significant relationship with GDP. However, the first and second lags of Investment were found to have a significant positive impact on GDP in the short run.

R-squared shows the explanatory power of the independent variables on the dependent variable. From the R-squared coefficient, it can be seen that about 90 percent variations in GDP are explained by the independent variables. The Adjusted R-Square also shows the explanatory power of the independent variables on

the dependent variables by imposing restrictions on the inclusion of additional variables, its coefficient shows that about 80 percent variations in GDP is explained by the independent variables. F-statistics and its probability value show the overall significance of the model, from the probability value (0.00), we can conclude that the model is fit and significant on the overall.

RESIDUAL DIAGNOSTICS

There are certain conditions in which the residuals of a model must satisfy before the model is accepted. The conditions are; it must be free from serial correlation, be homoscedastic and be normally distributed. To test for serial correlation, the study employed the Breusch-Godfrey LM test. The probability value of the test statistic (0.13) showed the acceptance of the null hypothesis, we could thus conclude that the residuals are free from serial correlation (see appendix one). BPG test for hetroskedaticity was also applied on the residuals; the probability value of the test statistic (0.28) shows residuals to be homoscedastic (see appendix two). Lastly, the Jarque-Bera normality test was also applied, the probability value of the test statistic (0.79) shows the acceptance of the null hypothesis, hence concluding that residuals are normally distributed (see appendix three).

SHORT RUN CAUSALITY

A variable is said to granger cause another variable if the past value of the variable is useful in forecasting the future values of the other variable. To examine the short run causality among the variables, the study employed the Wald Coefficient Restriction test and the result is presented in the table below:

TABLE 4.0: SHORT RUN CAUSALITY TEST RESULT

Direction of Causality	F- Statistic	Probability
ID > GDP	8.61	0.01*
ED > GDP	10.19	0.00*
DS > GDP	16.84	0.00*
INV> GDP	21.09	0.00*

Source: Author's computation.

* indicates statistical significance at 5%.

Table 4.0 presents result of short run causality among the variables. A variable is said to granger cause the other if the probability value is less than 0.05. From our result, the presence of causal relationship between all the variables and GDP was found, running from the variables to GDP. We could thus say that past values of all the variables are useful in forecasting the future values of GDP.

IMPULSE RESPONSE FUNCTION (IRF)

Impulse Response Function (IRF) is one of the tools of innovation accounting which shows the response of a variable to a unit standard deviation shock or innovation to itself and other endogenous variables in the model. It shows the time path into the future of how a variable respond to a shock in itself and other variables in the model. The IRF graphs are presented below:

Fig. 1.0 Response of GDP to Shock in Internal Debt.

FIG. 1.0: RESPONSE OF GDP TO SHOCK IN INTERNAL DEBT.

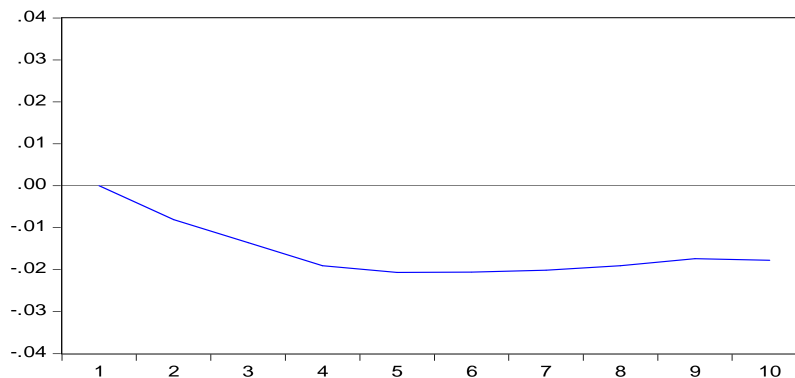

Figure 1.0 shows the response of GDP to innovations in Internal Debt. From the graph, it can be seen that GDP exhibited a negative response from the first period down to the tenth period. The response bottomed out around the fourth period. From the findings, it can be inferred that shocks in internal debt has a negative response in economic growth of India.

FIG. 2.0: RESPONSE OF GDP TO SHOCK IN EXTERNAL DEBT

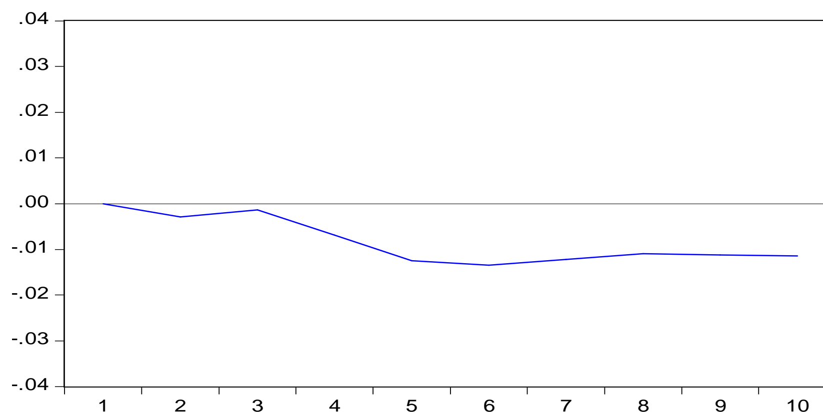

Figure 2.0 present the response of GDP to shock in external debt. From the graph, it can be seen that the response was mild, though negative from the first period down to the thirds period, but afterwards, the response became more intense. The negative response bottomed out around the sixth period and reduced a little following through to the tenth period. This is an indication that shocks in external debt exerts a negative effect on economic growth of India.

FIG. 3.0: RESPONSE OF GDP TO SHOCK IN DEBT SERVICING

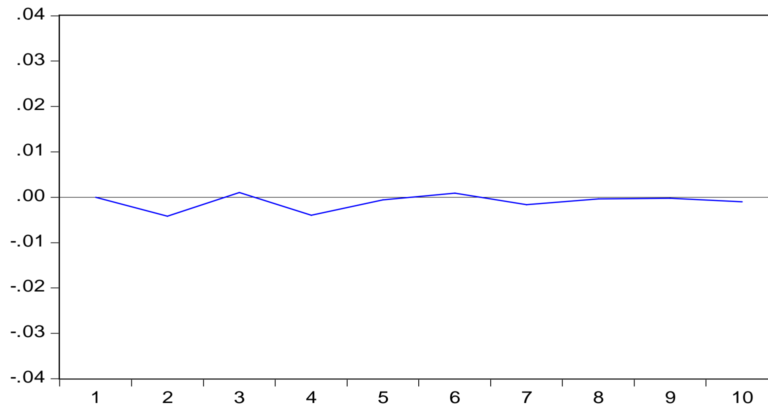

Figure 3.0 shows the response of GDP to shock in debt service payment. From the IRF plot, it can be seen that in the first period, the response was mild and negative, but returned to a zero response in the third period, and afterwards was negative up to the fifth period. From the fifth period to the tenth period, the response was virtually zero. The findings indicate that debt service payment has no much effect on economic growth, though at some instances it can have a mild negative effect.

FIG. 4.0: RESPONSE OF GDP TO SHOCK IN INVESTMENT

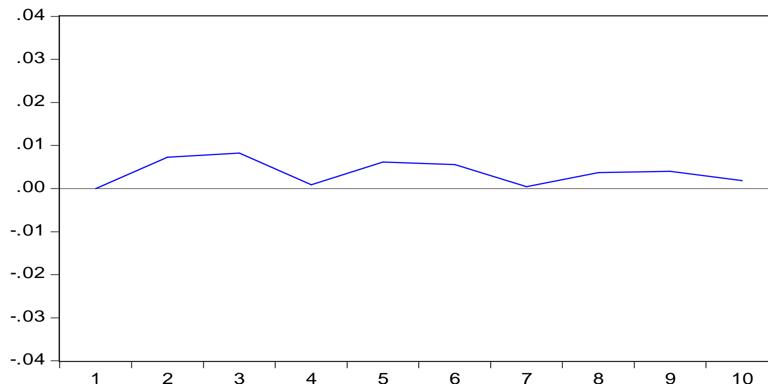

Figure 4.0 presents the response of GDP to shock in Investment. From the graph, it can be seen that response was positive from the first period to the fourth period, but in the fourth period, it became zero and afterwards began to rise and became zero again around the seven and again began to rise. The peak positive response was noticed around the third period. The finding is an indication that shock in investment has a positive impact on economic growth of India.

FORECAST ERROR VARIANCE DECOMPOSITION (FEVD)

This is another tool of innovation accounting. FEVD tries to show us how the errors in forecasting a variable are apportioned to itself and other variables in the model. In other words, FEVD shows us how the fluctuation or movement in a variable is attributed to its shock and shocks of other variables in the model. The FEVD result is presented in table 5.0.

TABLE 5.0: FORECAST ERROR VARIANCE DECOMPOSITION OF GDP

Period	S.E.	GDP	ID	ED	DS	INV
1	0.009157	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.035451	88.56731	5.194012	0.659837	1.385997	4.192842
3	0.045501	80.68686	12.08832	0.495093	0.890435	5.839286
4	0.052242	69.69283	22.49885	2.100460	1.248076	4.459783
5	0.061140	61.27069	27.84428	5.700258	0.920167	4.264612
6	0.067678	54.50986	31.96453	8.604340	0.768905	4.152365
7	0.072018	49.04306	36.06755	10.48701	0.731621	3.670757
8	0.076522	46.40250	38.12888	11.33143	0.650896	3.486294
9	0.080454	44.67140	39.14188	12.19319	0.589424	3.404102
10	0.083770	42.54922	40.58561	13.11456	0.558595	3.192015

Source: Author's own computation.

Table 5.0 presents the result of FEVD. From the result, it can be seen that in the first period, all the errors in forecasting GDP is attributed to GDP alone, but with time passage down to the fifth period, only 54 percent forecast error in forecasting GDP is attributed to GDP, while ID, ED, INV and DS accounts for about 27, 5, 4 and 0.9 percent respectively. As at the tenth period, GDP accounted for about 42 percent of its forecast error, while ID accounted for about 40 percent, followed by ED which accounts for about 13 percent, then INV with 3 percent and lastly DS with 0.55 percent. This finding is an indication that ID has more impact on GDP, followed closely by ED, then INV and lastly DS.

CONCLUSION

From the finding of the study, it was evident that there exists a long run positive impact of both external and internal debt on economic growth of India. This finding corroborates the notion that there is no one-way definite relationship between public debt and economic growth, what makes public debt to have a positive or negative impact depends on the purpose for which the debt was used on. In the Indian case, the positive effect points to the fact that when funds are borrowed by the government, it is directed towards productive activities that in the long run spring economic growth. Investment was also found to have a positive effect on economic growth. This finding is in conformity to theory, as you increase your investment stock, it is quite natural that it is expected to yield positive effect on economic growth. Debt servicing in the Indian case refers to the spending of government in servicing external borrowing. Findings of the study showed

debt servicing as having a negative effect on economic growth, this is due to the fact that when you service debt, funds are been taken out of the economy, and in the same vein, funds that would have been used for investment and development purpose by the government are taken out of the economy, this is likely to pose a negative effect on economic growth.

Among others, the study recommends that since public borrowing in the Indian scenario is found to be positively related with economic growth, the government can float public borrowing to finance its deficits. However, the government should keep the borrowing minimal in order to avoid a burden overhang on the future generation. As an alternative to borrowing, the government should diversify its revenue base by harnessing and making more effective its taxation system.

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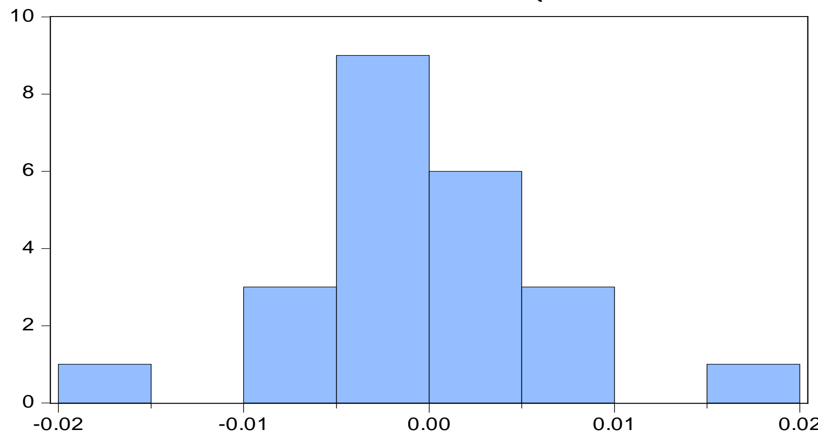
14. World Bank Development Indicators.

APPENDIX

TABLE 6.0

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.955395	Prob. F(2,9)	0.4205
Obs*R-squared	4.027956	Prob. Chi-Square(2)	0.1335
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.526039	Prob. F(15,7)	0.2945
Obs*R-squared	17.61369	Prob. Chi-Square(15)	0.2835
Scaled explained SS	5.394375	Prob. Chi-Square(15)	0.9882

FIG. 5.0: JARQUE-BERA NORMALITY TEST



Series: Residuals	
Sample 4 26	
Observations 23	
Mean	2.31e-17
Median	-0.000532
Maximum	0.015378
Minimum	-0.015803
Std. Dev.	0.006475
Skewness	0.089902
Kurtosis	3.677880
Jarque-Bera	0.471357
Probability	0.790035

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