

Optimal Government Debt and Economic Performance in Nigeria

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Abstract

Developing economies rely on government debts in financing its budget deficit. Nevertheless, debt incurred beyond a limit becomes detrimental to the economy. This study examined the optimal point beyond which government debt impairs economic performance in Nigeria. Data from the Central Bank of Nigeria (CBN) Statistical Bulletin from 1986 to 2017 were employed for the study. Dynamic Ordinary Least Square (DOLS) was used to estimate the magnitude of the coefficients. The unit root test showed that the variables of the study were stationary at a 5% significant level and the co-integration test confirmed a long-run relationship between the variables. The estimation showed a significant relationship between government debt and Nigeria's economic performance. Government debt is growth-enhancing at low levels but growth-retarding at a high level with the optimal government debt estimated as 9.98% of the gross domestic product (GDP). This implies that borrowing beyond such a limit becomes growth-retarding in the economy. The study concluded that an increase in government debt elevates Nigeria's economic performance. However, it becomes detrimental to the economy when surpasses the threshold level estimated in this study. Therefore, the study recommends that the government should focus on other sources of revenue to fund its budget deficits to decrease the debt burden. Also, the debt management office (DMO) of the federal government should introduce debt forgiveness measures that may encourage lending nations or entities to relax debt conditions, thereby reducing the debt profile of the country.

Keywords: Economic Performance, Dynamic Ordinary Least Square Model, Government Debt, Optimal Debt.

Introduction

Globally, government borrowing as a tool of macroeconomic administration is utilized for the correction of the budget deficit in order to aid economic growth. The justification for government borrowing has its source in the neoclassical growth models, which prescribes the need for countries with scarce capital to borrow in order to increase their capital accumulation and consequently the level of output per capita. While some economists argue

for more fiscal stimulus, others argue that raising debt levels would stunt economic growth and hence advocate a reduction in the nation's debt profile.

Government debt is classified as the aggregate of external debt and domestic debt. Indeed, much of the extraordinary growth in developing countries like Nigeria since the 1960s can be described as debt related. Government debt is considered as an important source of funding in developing countries. In recent years, the foreign debt problem has become one of the basic concerns of developing countries like the Republic of Benin, Togo Guinea, Liberia, Sierra Leone, Ghana and Nigeria amongst others. The debt crisis which occurred in the early 1980s destabilized the economy of many developing countries with low-income index thereby leading to economic distortion such as a high rate of inflation.

Determining the optimal debt level has thus become central to the discussion of economic growth in advanced and emerging economies. A number of deliberations have been discussed since the publication of Reinhart & Rogoff (2010) influential findings on the threshold effect of Government debt that debt to Gross Domestic Product ratio of 90% or more could have a negative impact on the economic performance of a nation. The findings have inspired a new discussion on literature seeking to assess whether macroeconomic policy actions as regards government debt be encouraged or discouraged by the borrowing nations.

Prior studies had focused mainly on the effect of government debt on economic growth in Nigeria and beyond (Boboye and Ojo, 2012; Ogunmuyiwa, 2011; Amaeteng and Amoako-Adu, 2002; Krugman, 2010; Hassan and Akhter, 2012). These studies failed to investigate the threshold at which public debt becomes detrimental to the economy. This is because knowing the optimal public debt threshold helps the government to be aware of its borrowing limits and its policy formulation.

Hence, it is necessary to investigate the threshold level at which government debt becomes optimal. Many studies in the different part of the world have been conducted to seek such thresholds (Schalevik, 2004; Abbas and Christensen, 2007; Greenidge, Craigwell, Thomas and Drakes, 2012; Grenade and Wright, 2014; Vighneswara, 2015; Chudik *et al* 2015; Mupunga and Le Roux, 2015).

In Nigeria, three notable studies had been conducted to investigate the optimal public debt thresholds (Ikudaisi *et al* 2015; Omotosho *et al* 2016; Eboreime and Sunday, 2017). Arguably, the conclusions of these studies differ. While Eboreime and Sunday (2017) concluded that the optimal total debt-GDP threshold for Nigeria is 55.2%, Omotosho *et al* (2016) concluded that the optimal debt-GDP threshold for Nigeria is 21.4% and 26.9% for domestic debt and external debt respectively. Moreover, Ikudaisi *et al* (2015) concluded that the optimal total public debt-GDP threshold for Nigeria is 73.7%. Hence, there is a need to re-examine the optimal public debt-GDP threshold in Nigeria due to the lack of consensus among previous studies and because of the recent economic trend of increase in the debt servicing in Nigeria (DMO, 2017).

Accordingly, government debt is a means of financing budget deficit, it is, therefore, necessary to investigate the saturation point beyond which public debt begins to exert negative effects on economic growth. These are some of the crucial reasons that precipitated this study. Therefore, this study tends to determine the optimal total government debt threshold for Nigeria beyond which economic growth declines. In addition, the study seeks to determine whether there is evidence of a linear relationship between government debt and economic performance in Nigeria.

This study is divided into four sections. Section one covers the introduction, including the research questions and objectives of the study. Section two deals with the review of the

literature. Section three focused on the methodology of the study while section four deals with the analysis of data, interpretation of results, conclusions and suggests policy recommendation based on the findings.

Review of Literature

An econometric study conducted by Abbas and Christensen (2007) to investigate optimal domestic debt levels in low-income countries (including 40 sub-Saharan Africa countries) and emerging markets between 1975 and 2004 and found that moderate levels of domestic debt as a percentage of GDP have significant positive effects on economic growth. While Muhdi and Sasaki (2009) examined the macroeconomic effects of external and domestic debt in Indonesia by applying Ordinary Least Square (OLS) estimation for the period 1991 to 2006. The study found the positive effects of the rising trend of external debt on both investment and economic growth.

Boboye and Ojo (2012) studied the effects of external debt on economic growth in Nigeria. They found that external debt had a negative effect on national income and per capita income of Nigeria. The increase in debt level leads to the devaluation of the country's currency, retrenchment of workers, regular industrial strikes, and poor education. As a result, the level of economic growth and development declined. This study sheds light on the effect of public debt on economic growth in the context of a developing African country.

Chudik, Mohaddes, Pesaran, and Raissi (2015) investigated the debt-threshold effect in a panel study comprising both developing and advanced countries using the autoregressive distributed lag (ARDL). The study analyzed the threshold ranges between 60-80% for full sample; 30-60% for developing countries; and 80% for the advanced economies.

Eboreime and Sunday (2017) examined the threshold effects of government debt on output growth in Nigeria from 1981 to 2015 using an eclectic methodological approach by focusing on basic least squares, autoregressive distributed lag, and global optimization methods. The findings showed that optimal domestic debt to GDP threshold for Nigeria is 13.6% and evidenced that the optimal total government debt to GDP threshold for Nigeria is 55.2%.

Greenidge, Craigwell, Thomas, and Drakes (2012) addressed the issue of threshold effects between public debt and economic growth in the Caribbean. The main finding is that there exists a threshold debt to gross domestic product (GDP) ratio of 55–56 percent. Moreover, the debt dynamics begin changing well before this threshold is reached. Specifically, at debt levels lower than 30 percent of GDP, increases in the debt-to-GDP ratio are associated with faster economic growth. However, as debt rises beyond 30 percent, the effects on economic growth diminish rapidly and at debt levels reaching 55–56 percent of GDP, the growth impacts switch from positive to negative. Thus, beyond this threshold, debt becomes a drag on growth. Similarly, Vighneswara (2015) investigated government debt and economic growth thresholds and debt intolerance in India. The study concluded that the surge of government debt during the post-global financial crisis and the euro-zone sovereign debt crisis has begun raising concerns about whether government debt levels have hit the tipping points.

Grenade and Wright (2014) investigated the debt-growth nexus and the non-linearity issue using panel dynamic ordinary least squares estimations and threshold dynamics in 13 Caribbean countries, the study also calibrates an optimal debt/GDP ratio for each country using a modified Blanchard exercise, and tests the crowding-out hypothesis by examining the debt-investment link. The empirical results support the view that there is a non-linear relationship between debt and growth. The findings suggest that there is a global tipping point for the debt/GDP ratio of 61 percent beyond which debt adversely impacts growth and

investment. At the country level, the results show marked divergence between actual debt/GDP ratios and the calibrated optimal ratios. The empirical findings have policy relevance for Caribbean countries that are challenged by persistent high debt and low growth in the context where development is financed largely by debt accumulation.

Mupunga and LeRoux (2015) examined the optimal government debt threshold for Zimbabwe. The government debt threshold is estimated by assessing the relationship between government debt and economic growth. The analysis confirms the existence of a linear relationship between government debt and economic growth in Zimbabwe. The confirmed that the optimal growth maximizing government debt to GDP ratio in Zimbabwe lies between 45 and 50%.

Ikudaisi, Olagunju, Babatunde, Irhivben and Okoruwa (2015) examined non-linear relationship between economic growth and government debts from 1981 to 2011 using varieties of regression analysis. The study revealed that the ratio of debt to GDP of 21.4% exist for domestic debt and 26.9% for foreign debt.

Omotoso, Bawa and Doguwa (2016) investigated the existence of threshold effects in the relationship between public debt and economic growth in Nigeria using quarterly data. The study found non linear relationship between public debt and economic growth. The findings identified a threshold level of 73.70%, while the estimated saturation points for foreign and domestic debts were 49.4 and 30.9%, respectively. The implication of this finding is that debt accumulation in excess of the estimated threshold levels could hurt economic growth. A retrospective examination of the country's total and external debts profile indicated that the estimated threshold levels were exceeded prior to the debt forgiveness negotiated in 2005 and largely within limits afterward. In addition, the study found empirical support for external debt accumulation opportunities.

Ogunmuyiwa (2011) investigated the relationship between external debt and economic growth in developing countries using Nigeria as a case study. Time series data from 1970-2007 were fitted into the regression equation employing various econometric techniques such as Granger causality test, Johansen co-integration test and Vector Error Correction Method (VECM). His study reveals that causality does not exist between external debt and economic growth as causation between debt and growth was also found to be weak and insignificant in Nigeria.

Reinhart and Rogoff (2010) studied the relationship between high public debt and growth in advanced economies using a long time series that span 200 years. The findings indicate that the debt-growth link is relatively weak at "normal" debt levels but strong otherwise. For instance, when debt is low (below 30%), the average growth rate is 3.7%; when debt levels range from 30 to 90%, the mean growth rate for the countries in the data set declined to 3%. However, at high debt-GDP levels (in excess of 90%), the growth rate was found to decelerate significantly to 1.7%. Hence, this study postulated the following hypothesis:

H₀₁: government debt does not grow faster than economic performance in Nigeria

H₀₂: There is no significant non-linear relationship between government debt and economic performance in Nigeria

H₀₃: Government debt does not have an optimal threshold in relation to economic performance in Nigeria

Methodology

Theoretical Framework and Model Specification

The theoretical framework of this study is based on the neoclassical theory of economic growth which stresses capital, labour and technological progress as the main determinant of economic growth. In economics, the Cobb-Douglas functional form of the production function is widely used to represent the relationship of output to input. The Cobb-Douglas production function considers a simplified view of the economy in which production output is determined by the amount of labor involved and the amount of capital invested. It was used as a means for calculating the impact of changes in the inputs, the relevant efficiencies and the yield of production activity.

$$Y=(K, L)..... 3.1$$

Where Y represents real output (RGDP), K and L represent the quantity of capital and labor respectively, used for the production while A captures the economy’s productivity. This production function is assumed to have the Augmented Cobb-Douglas functional form which assumes production to grow in a constant exponential rate and is represented as:

$$Y = AK^\alpha L^\beta3.2$$

Where:

Y= real GDP per capita at time (t)

A= Economy’s productivity

K= capital stock

L= Labour

Where α and β are elasticity coefficients

Specifying equation (3.2) in intensive form by dividing through with labor (L):

$$\frac{Y}{L} = A \frac{k}{L} \cdot \frac{L}{L}$$

$$y = AK.1$$

Therefore,

$$y = Ak^\alpha 3.3$$

From equation (3.3), an explicit estimation function is specified after taking the natural logs of both sides as follows:

$$\ln y = \ln A + \alpha \ln k + \epsilon_t 3.4$$

Government debt (GD) affects economic performance; and that the level of technical efficiency (A) is influenced by some control variables, such as gross fixed capital formation (GFC) and savings (SAV) are included in the model because it is a macroeconomic indicator in an open economy. The *a priori* expectation is a positive relationship between the variables of the model except for the square of government debt which is expected to be negative.

$$A = f(\text{Government debt}) 3.5$$

From equation 3.4 and 3.5 above, the variables for this study can be fitted in thus:

$$\ln \text{RGDP}_t = \phi_1 + \phi_2 \ln \text{GD}_t + \phi_3 \ln \text{GD}_t^2 + \phi_4 \ln \text{GFC}_t + \phi_5 \ln \text{SAV}_t + \epsilon_t 3.6$$

Where;

RGDP =Real Gross Domestic Product as a proxy for economic performance

GD = Government Debt to RGDP ratio

GD² = Square of government debt to RGDP ratio

GFC = Gross fixed capital formation as a proxy for investment.

SAV = savings

ϕ_1 = intercepts

$\phi_2 - \phi_5$ = coefficients of variables in the model

ϵ_t = error term.

Source of Data

The data used in this study are mainly time series secondary data from 1986 to 2017. Data were extracted from the Central Bank of Nigeria (CBN) annual statistical bulletin of 2017.

Estimation Techniques

It is widely believed that the econometric estimation of a model based on time-series data, demands that the series be stationary, as non-stationary series usually result in misleading inferences. The Augmented Dickey-Fuller (ADF) test is an approach for testing the existence of a unit roots in the same series. The main objective of applying the ADF unit root test for individual series included in the model is to provide evidence as to whether the variables used in the regression process are stationary or not and to indicate the order of integration. The Johansen Co-integration approach can examine the number of co-integration vectors for any given number of variables that are not stationary at level.

The first objective of the study is achieved through the estimation of the moving average of government debt and real GDP in Nigeria. Furthermore, equation (3.6) was estimated to achieve the second and third objectives of the study through the dynamic ordinary least square (DOLS). In econometric techniques, DOLS applies the semi-parametric correction to eliminate the long-run correlation between the co-integration equation and the innovations (Philip & Hansen, 1990).

Noticeable methodological weakness in literature is that studies in Nigeria (Ikudaisi *et al* 2015; Omotosho *et al* 2016; Eboreime and Sunday, 2017) estimated the coefficients of its model through econometric techniques with lagged variables such as Autoregressive Distribution Lag (ARDL) and Vector Error Correction Model (VECM) which might have suppressed the explanatory power of the independent variables (Achan, 2001). Hence, the Dynamic ordinary least square (DOLS) provides optimal estimates of co-integration regression (Phillips and Hansen, 1990).

Analysis and Interpretation of Results

Unit Root Test

Table 1

Unit Root Test Result

Variable	Level		1 st Difference		Conclusion
	Test Stat	Critical values@5%	Test stat	Critical values@5%	
RGDP	-3.06	-2.964	--	-----	I(0)
GD	-0.075	-2.964	-3.11	-2.964	I(1)
GD²	-4.30	-2.964	---	-----	I(0)
GFC	-5.30	-2.964	---	-----	I(0)
SAV	-8.32	-2.964	---	-----	I(0)

Source: Authors' Computation, 2019.

Where: I(0) = Stationary at level

I(1)= first difference

Table 3 revealed the augmented dickey fuller (ADF) unit root test. The results showed that real gross domestic product, the square of government debt to GDP ratio, gross fixed capital formation, and savings are stationary at level; the absolute values of the ADF test statistics of all the variables are greater than the 5% critical value (-2.963972) at level. However, government debt to the RGDP ratio is stationary at first difference. Thus, the variables were stationary in the model. Hence, the co-integration test is necessary to examine if the long-run relationship exists among the variables for the study.

Co-integration Test

Table 2

Empirical Result of Unrestricted Co-integration

Rank Test (Trace)

Trace Stat	0.05		Hypothesized No. of CE(s)	Prob.**
	Critical Value	Eigen value		
96.76	69.82	0.750	None *	0.00
53.73	47.85	0.567	At most 1 *	0.01
27.75	29.79	0.464	At most 2	0.08
8.417	15.49	0.215	At most 3	0.42
0.885	3.842	0.028	At most 4	0.34

Source: Authors' Computation, 2019.

Trace test indicates 2 co-integrating equations at the 0.05 level

Using the unrestricted co-integration test-Trace test, with the values of the unrestricted co-integration test, Trace was greater than the value of the critical value at 5% level of significance. The test statistics indicate that the Hypothesis of no co-integration among the variables can be rejected. The finding implies that there is a long-run relationship between variables in the model.

To capture the first objective of this study; to investigate if government debt grows faster than the gross domestic product in Nigeria was achieved through estimation of the moving average of government debt and GDP in Nigeria during the study period.

Table 3

Moving Average of Government Debt and Real GDP in Nigeria, 1986-2017.

10 years moving average of Real GDP	10 years moving average of Government Debt
18239.72	466.1
18833.71	635.07
19486.23	731.1
20097.98	832.38
20613.45	1140.86
21051.71	1502.15
21658.56	1877.01
22592.31	2314.68
23770.46	2804.78
25274.6	3325.2
24854.78	3627.38
28868.54	3744.58
30981.87	3895.66
33349.83	4060.64
36090.48	4105.26
39182.89	4229.87
42407.25	4462.51
45504.47	4709.06
48655.4	4978.89
51868.63	5306.39
55023.52	5979.14
57817.1	7212.38
60373.95	8787.36

Source: Authors' Computation, 2019.

Table 3 shows the ten years moving an average of real GDP and government debt between 1986 and 2017. In summary, the moving average of the real GDP reveals inconsistencies in the sequence of its ten (10) years moving average with a combination of increase and decrease in the sequence. For instance, the first ten moving average recorded a persistent increase in the sequence from 18239.72 to 25274.6 while the eleventh moving average recorded a decline at 24854.78, then the moving average starts increasing thereafter. However, the ten years moving an average of public debt recorded a persistent increase over the study period without any decline. This rejects the Null hypothesis which states that "government debt does not grow faster than economic performance in Nigeria". Therefore, the Alternative Hypothesis, which states that "government debt grows faster than economic performance in Nigeria" is accepted.

DOLS Estimation

Table 4

The Empirical Result of Dynamic Ordinary Least Square

Dependent Variable: RGDP

Method: Dynamic Least Squares (DOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GD	0.012268	0.00536	2.287	0.0411
GD ²	-0.061406	0.01995	-3.077	0.0096
GFC	0.268904	0.01236	21.76	0.0000
SAV	0.091709	0.02385	3.845	0.0023
C	8.871855	0.12462	71.19	0.0000

Source: Authors' Computation, 2019.

Table 4 shows the result of the non-linear DOLS estimation technique with Newey-West Heteroskedasticity and Autocorrelation Consistent Covariance (HAC) procedure, to correct for serial autocorrelation. It revealed that the coefficient of government debt (GD) at 0.012268 and the coefficient of the square of government debt (GD²) at -0.061406 on real gross domestic product in the model. Findings show that government debt has a significant positive relationship with economic performance in Nigeria while the square of government debt has a significant negative relationship with economic performance in Nigeria. This implies that government debt helps to boost the economy of Nigeria; however, a further increase in public debt beyond the optimal level is detrimental to the economy. This confirmed an inverted U-shaped non-linear relationship between public debt and economic growth in Nigeria. Hence, it is statistically significant at a 5% level of significance at a probability value below 0.05. This finding is supported by Ikudaisi *et al* (2015) and Omotosho *et al* (2016). Also, the level of investment proxied by gross fixed capital formation and savings is significant in the model with a probability of 0.0000 and 0.0023 respectively. This rejects the Null hypothesis at 5% significant level which states that "There is no significant non-linear relationship between government debt and economic performance in Nigeria". Therefore, the Alternative Hypothesis, which states that "There is a significant non-linear relationship between government debt and economic performance in Nigeria" is accepted.

Optimal Level of Government Debt in Nigeria

To estimate the optimal level of government debt in Nigeria, it is required to find the partial derivative of real gross domestic product (RGDP) with respect to government debt (GD) assuming that the other variables in the model (gross fixed capital formation (GFC) and savings (SAV) are held constant in equation 3.9.

$$\frac{dRGDP}{dGD} = \phi_2 - 2(\phi_3 GD)$$

For optimality or maximization; the first order condition is equal to zero (Koustoyiannis, 1979).

$$\phi_2 - 2(\phi_3 GD) = 0$$

$$\phi_2 = 2(\phi_3 GD)$$

$$GD = \frac{\phi_2}{2\phi_3}$$

Where GD is government debt, ϕ_2 is the coefficient of government debt to RGDP ratio in the non-linear model, ϕ_3 is the coefficient of the square of government debt to RGDP ratio in the non-linear model. From the DOLS estimation $\phi_2 = 0.012268$ and $\phi_3 = 0.122812$. Therefore,

$$GD = \frac{0.012268}{2(0.061406)} = \frac{0.012268}{0.122812} = 0.0998 = 9.98\%$$

This rejects the Null hypothesis which states that "Government debt does not have an optimal level in relation to economic performance in Nigeria". Therefore, the Alternative Hypothesis, which states that "Government debt has an optimal threshold in relation to economic performance in Nigeria", is accepted. Based on the economic realities in Nigeria, whereby debt servicing gulps over 50% of Nigeria's revenue as affirmed by the African Development Bank (AfDB), an increase in government debt might be detrimental to the economy.

Discussion of Findings

The preliminary analyses (unit root and cointegration tests) showed that the variables are stationary and cointegrated in the study. Real gross domestic product, the square of government debt, gross fixed capital formation and savings are stationary at a level while government debt at first difference.

The Moving Average estimate revealed that government debt grows faster than economic growth in Nigeria. This finding is in agreement with the assertions of Osuma *et al* (2018) and Eze *et al* (2019).

Furthermore, in conformity with the findings of Ikudaisi *et al* (2015), Omotosho *et al* (2016), Kiptotich and Maingi (2018) and Shkolyuk (2018); the DOLS estimate showed that a non-linear relationship exists between government debt and economic performance. This implies that government borrowing beyond a saturation point is inimical to the economy.

In order to discover such a saturation point in Nigeria, the study revealed the optimal point of public debt in relation to economic performance. Similar to the findings of Chen and Lin (2017) in China, there exists a significant optimal debt threshold in Nigeria. The study revealed the optimal government debt as 9.98 percent of the GDP in the economy. Based on the recent economic realities in Nigeria of high rate of unemployment and the continuous increase in the price level of consumable goods, this estimate is contrary to Ikudaisi *et al* (2015) and Omotosho *et al* (2016) who suggested 21.4% and 26.9%, 30.9% and 49.4% as the optimal debt to GDP threshold for domestic and foreign debt in Nigeria respectively.

Also, with the recent increase in the level of insurgency and insecurity, government borrowings are geared towards curtailing insecurity in the country instead of being invested in social infrastructure or other productive ventures of the economy. This recent trend has made increasing government debt harmful to the Nigerian economy.

Conclusion and Policy Recommendation

Based on the empirical findings, it is established that the economy of Nigeria is significantly influenced by such dynamic variables as government debt, the square of government debt, gross fixed capital formation and savings for the period 1986-2017. In line with theoretical assumptions, the findings confirmed that increase in government debt increases economic growth in Nigeria but an additional increase in government borrowing beyond the estimated level becomes detrimental to the economy as revealed in the confirmation of a non-linear relationship between government debt and the level of economic performance in Nigeria. The findings revealed that government debt has a significant positive relationship with

Nigeria's economic performance while the square of government debt has a significant but negative relationship with Nigeria's economic performance. The findings also confirmed that government debt grows faster than economic performance in Nigeria. The findings also revealed that for the Nigeria economy to be optimal, the Nigerian debt profile should not exceed 9.98% of the GDP based on the economic realities in Nigeria.

The economic implication of these findings is that the government of Nigeria should maintain a healthy debt profile which is not more than the optimal point (9.98% of the gross domestic product) for the economy to perform better. According to the Federal Ministry of Finance, Nigeria's current debt to GDP ratio stands at 21.30% which is far above the optimal public debt estimated in this study. Further increase in government borrowing might lead to a catastrophic trend in the Nigerian economy. Based on the findings of the study, the following recommendations are made:

- The government needs to focus on other sources of revenue to fund her budget deficits and rely less on loans to address future budget deficits. This can be achieved through an efficient tax system whereby the government generates revenue by imposing a compulsory levy on the income and properties on the taxpayers.
- The government should monitor the rate of growth in its debt so that the debt incurred by the government does not exceed the rate at which the economy is growing.
- Also, the debt management office (DMO) of the federal government should introduce debt forgiveness policies or measures that may encourage lending nations or entities to pardon some of the debts incurred by the government thereby reducing the debt profile of the country.

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