

Sustainability of Domestic Debt in Nigeria: An ARDL Bounds Testing Cointegration Approach

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Abstract: This study assesses the domestic debt sustainability due to the fluctuation in revenue of most African States, principally when it relates with the effects of the financially crisis and global economic turn oil that emanates from western countries. The situation has become a vexed issue particularly for policy makers from mineral (oil) resource nations. However, oil sector remains the major revenue in Nigeria and the largest economy in the continent. Therefore, the linkage with the shortage in revenue gap from traditional sources to fund government budgets in recent time makes it crucial yet disturbing. For this reason, it becomes inevitable to usher fiscal policy reforms in Debt Management Office (DMO), pension's funds, bounds market and geared to deepen the financial system to aid and sustain growth and development. Accordingly, this policy has led to an upsurge in domestic debt/borrowing over external debt/borrowings. Consequently, the policy has raised several concerns and has become more worrisome regarding sustainability of the debt. More specifically, this study aims to assess whether this policy path is sustainable or not. In order to achieve this objective, the researchers adopt the celebrated Hamilton and Flavin Inter temporal Budget Constraint (IBC) framework approach using ARDL bounds testing cointegration technique with annual data set for the period 1981-2013 fiscal years. It can be found from the data analysis that the government domestic debt do not show any cointegration in the long run signifying that government domestic debt do not comply with the IBC rule. Hence forth, policy makers should implement strict compliance to obey the IBC. Furthermore, government should ensure a sustainable and innovative debt management system and pursue alternatives to oil revenue management by diversifying the revenue base due to unsustainability of the stance. Since consolidation may not be an option due to the dangerous level of welfare and development.

Key words: ARDL bounds testing, domestic debt, financing government budget, sustainability, oil revenue and non-oil revenue

INTRODUCTION

Over the years, the upsurge in domestic debt over external debt has generated heated debates in Sub Saharan African states in reference to its sustainability and it's implication on the economy (Panizza and Presbitero, 2014). For instance, Hanson (2007) noted that domestic debt grew faster than Gross Domestic Product (GDP) from 1994-2004; this growing trend has continue to persist on abated and may be linked with the challenges of debt overhang, global crisis and pursuance of growth furthermore, it is attributed to both developing and developed countries. Reinhart and Rogoff (2010) posited that both developed and developing countries are not immune to debt related crisis. Hence, this issue has instigated the current outcry about the sustainability of domestic debt (Reinhart and Rogoff, 2011a, b; Chalk and Hemming 2000; Abbas and Christensen, 2010) Fig. 1.

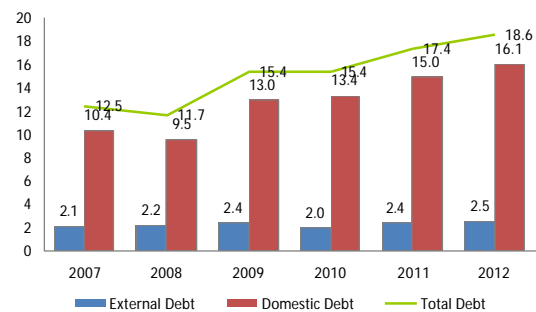


Fig. 1: Consolidated public debt stock (as percent of GDP)

This concern about domestic debt has also prompted the current reawakening in debate lately by policy makers, public commentators, activists, credit rating agencies, economists and development institutions due to the

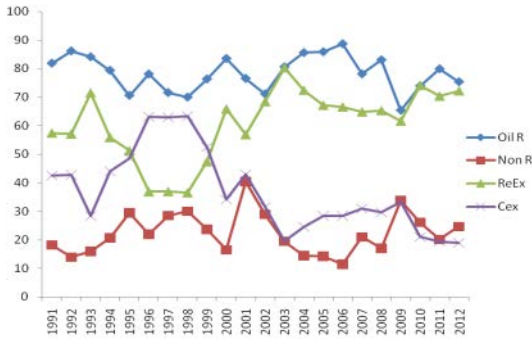


Fig. 2: Oil Revenue (Oil R), Non-oil Revenue (Non R), Recurrent Expenditure (ReEx), Capital expenditure (Cex) as a percentage of total revenue.1995-2012; author’s compilation

possibilities of their economy becoming insolvent and the consequence on economic growth. In the same line Asian Development Bank in 2012 but stressed that the financial crisis led to an unprecedented fiscal intervention by governments around the world. The subsequent build up in public debt, in particular its sustainability has gained attention in the policy debate. Interestingly, studies in this area have remained scanty, unlike external debt that is replete in literature. Also debt is viewed widely especially, in the context of Sub Saharan African countries that had suffered a gloomy experience in recent past relating to external debt and the fear in the current switch to domestic debt (Eichengreen *et al.*, 2007; Hanson, 2007). Moreover, Sub Saharan Africa is largely, confronted with wallowing poverty, infrastructural deficit, unsustainable growth and issues of underdevelopment (World Bank, 2002). Thus, developing economies are in dire need of critical steady funds, to finance government budgets that may drive and speed up development. Meanwhile this effort is being threatened, by surges in government overall revenue that are anchored on volatile oil revenue and other forms such as aid, FDI, remittances, ODA by the global economic downturn.

Hence, there is the need to conduct proper investigation and assessment, on the sustainability of domestic debt, given the fiscal position of government in regard to the structure of its revenue and expenditure behaviour over time in order to boost economic growth and development. However, the questions are how can, African states and in particular Nigeria, tackle this tripartite issue of falling and unpredictable revenue, increasing state activity, in the form of increased expenditure, and through mounting domestic debt? More so, in view of the global slowdown and the fall in price of

crude oil with more discoveries which may resulted to glut in supply and the quest for alternative energy source.

Oil rich producing countries, such as Nigeria, have been exposed to massive cuts in revenues, as showed in Fig. 2 the trend and fluctuations of revenue (oil and non-oil) and expenditure in relation, to the structure of the fiscal budgets over the years. Meanwhile, the surges in government revenue from traditional sources may constitute a great danger for fiscal policy makers, especially in their quest to attain macroeconomic goals, stability and becoming one of the largest 20th economies in 2020. Furthermore, to curtail failure or avoidance of mismatch in expected revenue, to finance planned expenditure government over the years, indulged in massive domestic borrowing. Besides, the gap in revenue may have also, contributed to government resort to the debt market in order to augment for the shortfall in revenue that is predominantly from volatile oil source. Consequently, with the Non-oil revenue so far, contributing a barely 20%, of total revenue calls for greater concern regarding borrowing by governments in financing budgets. Statistics, from Central Bank of Nigeria have shown that over the years, increases in total revenue are mainly triggered by an increase in the price of crude oil in the International market. Therefore, exposing the economy to shocks, and vagaries, of International crude oil price and other related socio-economic implications (Aizenman, 2004). Hence, the over reliance, on petro dollars to the detriment of other sources (Non-oil revenue), may have exposed the biggest economy, in Africa at risk (International Monetary Fund, Africa Development Bank) (International Monetary Report, 2014).

Hence, on one hand, the calls, for innovative, strong regulatory way of managing debt or/and at the other hand, improving or diversifying the revenue base of the economy or both in order to, finance government budgets specifically infrastructural deficit that plagues the country (World Bank, 2002). This will require sustained and continuous payments (debt) from government cash flows and at the same time driving development, by increased expenditure through a functional developed financial system (Fry, 1997). Furthermore, the pursuance of fiscal policy reforms that is driven and geared to enhance an effective and efficient deepening of the financial debt market that ensures the debt flows and is sustained, is desirable (Aizenman, 2004; Fry, 1978).

Moreover, the dismal performance of Non-oil revenue sector of the Nigerian economy is worrisome. Besides, it may be suggestive to government inability to tax, given the hardship experienced by the greater majority of the

people and by extension the likely socio political implication to the country. In addition, tax is highly desirable and more certain but very sensitive in developing economies and as such governments are faced with a dilemma to either tax or borrow and borrowing could be sourced either from within or from external. However, in recent time government had found it easier to borrow domestically and this has taken place across the three tiers of governments in Nigeria. Hence, the states and local governments are linking it to their low internal revenue and fallen national federation allocation. Thus has resulted to the challenge of finance of governments' budgets with current revenue at all levels in the federating states in the county.

Consequently, this has prompted several questions in the country and beyond (Nigeria Institute for Social and Economic Research NISER in 2014) regarding the sustainability of domestic debt. Whereas, given the level of fluctuations in oil revenue and Non-oil revenue particularly for oil rich nations like Nigeria, there is an urgent need for scrutiny. Thus, the issue now is can government continue to borrow indefinitely and will investors continue to lend to government? This and many more questions have continued to agitate discussion at policy levels, among experts in finance, investors, credit rating agencies, economists and development institutions. Meanwhile, government is desirous of fast tracking development which requires, sustained spending that may also be threatened by the ballooning domestic debt if investors perceives is being recycled.

Hence, our study seeks to employ ARDL bounds testing approach to relay and capture the dynamic nature and structure of the behaviour of policy maker's budget if there is existence of cointegration and long run relationship between government spending, government revenue (oil and Non-oil) and domestic debt. Hence, this study is expected to contribute to literature, given that this study differs from the study of Mohammed and likewise other studies that engaged univariate time series approach to assess sustainability beginning with Hamilton and Flavin (1985) with data time series of government deficit and debt.

Literature review: Since, the pioneered work of Hamilton and Flavin (1985) for which he confirmed (United States of America (USA) debt to be sustainable by employing unit root test. The idea as proposed has its basis on government being constraint/limited in the course of borrowing being that government cannot resort to a permanent or continuous borrowing or on the alternative investors would likely refrain from lending to government unless they perceive a commitment by policy makers in

balancing its budgets. The IBC is the first major attempt to assess and test this two contending idea in regards to government budget. Several studies continue to spur in the literature on sustainability and effort made to gauge and asses the levels of stationary, amongst variables of interest in relation to any phenomena in the economy. Likewise, the resultant outcomes from assessment continue to generate more controversial results even on extreme cases where the same data and period were involved but mostly, on the basis of integration of the unit roots of the series. Thus, researcher engage different techniques in assessing sustainability and consequently, the call for further tests for unit root approach in the case of Nigeria, with emphasis on monetary policy in creating debt by the Central Bank contrary to this study which focuses on fiscal policy and debt raised through the debt market. Therefore, Trehan and Walsh (1988, 1991) having, found positive unit root suggested, for a further cointegration test as a sufficient condition. In that connection, the sustainability, of the USA debt and deficit were found to be unsustainable, suggesting the non-compliance with the IBC rule, after further testing for cointegration. Besides, a study conducted in Nigeria by Mohammed using data set for 1970-2006 the author further engaged, real GDP, Primary deficit, Outstanding domestic debt and Inflation using (Augmented Dickey Fuller ((ADF) approach for unit root test for stationarity with and without structural breaks in order to accommodate for possible shocks in the system. The result was stationary at I (0) suggesting a sustainable position. Wilcox (1989) and Kremers extended the study by the allowing for stochastic interest rate and setting assumption for the discounted debt of IBC to be nonstationary and both arrived at the fiscal position of the debt being unsustainable. On the other, Trehan and Walsh (1991) yet suggested further examination by introducing cointegration techniques, after testing the series for stationary. Their investigation revealed evidence of non stationarity of debts in the USA. They equally, stretched their argument that for the IBC to hold, debt and deficit are to be integrated and the interest rate is being held constant. In other words, sustainability is considered to be necessary and sufficient when the debt and primary balance are cointegrated. Trehan and Walsh (1991) still following the idea, of IBC using different variable tested the series for existence of cointegration using net of expenditures, revenues interest payment, and the outstanding stock of debt. Meanwhile, the interest rates held constant while differencing for the revenue and expenditure which led to an error correction. Further test was conducted where the interest rate was not held constant shows the result does not hold. Wilcox (1989)

performed another investigation using the same data as Hamilton and Flavin (1985) but obtained a different result as debt being unsustainable due to relaxing some restriction performed on the interest rate and suggested the usefulness of including other variables aside the debt. Afonso (2005) conducted a study of some European countries on the long run relationship between the expenditure and revenue series obtained varying results between them. Similarly, Chalk (1998) conducted for G7 countries and concluded that there is a need to narrow the approach to sustainability in theory and practice due to the emphasis on indicators that may vary most often among them and the need is for country study remains important. This is the main departure; of the study from others as it seek to investigate the fiscal policy direction of policy makers in regards to the behaviour and structure of the budget over the years of the largest economy in the continent with oil resource as main revenue source of the economy.

Furthermore, it remains instructive for countries case specific approach as different countries pursue policy that are tailored to suit that needs even though, they may have common classification but there history, experience and efforts may differ and the idea to group countries in panel of studies maybe therefore, misleading. This study underscores, the imperative to engage and extent the literature by using the approach of ARDL bounds cointegration test to assess the effort and behaviour of policy makers in Nigeria in confronting the challenge posed by dwindling revenue from (oil and non oil) and increase build up, in domestic debt to finance government expenditure. Hence, Chalk (1998) suggested that government, will in the future be committed to comply by balancing the budget otherwise, government cannot be seen to engage in borrowing forever or government is not seen to be in the habit of engaging in a Ponzi game by continuously refinancing and rolling over her debt through the issuance of more debt.

MATERIALS AND METHODS

Data and variables: Data set used for this study consist of annualized time series which were obtained from Central Bank of Nigeria (CBN) on domestic debt, oil revenue, non-oil revenue, total expenditure and total revenue. The period characterized the behaviour and structure of government public finance spending for the fiscal years 1981-2013 in relation to the fiscal variables their inclusion base on (International Monetary Report, 2014; Wilcox, 1989). Thus, our variables are expressed in log forms at time (t) as represented; Oil revenue (lnor), Non oil revenue (lnnor), Total expenditure (lnxt), Total revenue (lntr),

Domestic debt (lndd) and error term (e) (was utilized. Hence, as a first order condition we set to employ unit roots test for stationarity of the variables and then proceeded for the ARDL bounds cointegration test as a sufficient condition both in line with (Hamilton and Flavin 1985; Trehan and Walsh, 1991). Thus, our technique is deem to be superior due to its ability and advantage to overcome, weaknesses and controvesy, in respect of the integration levels of data being either I (0) or I (1) or mix. However, using unit root test approach may lead to disparity in result, as earlierly discussed. Futhermore when compared to other form of multi variate conitegration technique such Johasen and Juselius which is hardly attainable and with the absence of any strict economic theory to the model (Pesaran *et al.*, 2001). In addition due to the nature of our small sample size, underscores, following Narayan (2005) critical values that takes cognizance of the data span.

Method of data analysis: The idea of Hamilton and Flavin (1986) triggered several studies such as Wilcox (1989), Trehan and Walsh (1988, 1991), Afonso (2005), Akyus (2010), Koo (2008) and Chalk and Hemming (2000). The technique allows for the series to be tested using unit roots and for various cointegration techniques especially long run. Consequently, this study is distinct from others as we employed ARDL bound testing cointegration approach, that permits for the data to be tested without relying on whether, they are stationary at purely I (0) and I (1), I (0) or I (1) (Pesaran *et al.*, 2001) it is also anchored on the Wald test (implimenting of F statistics of the bounds testing approach via the critical values of I (1) and I (0)) suggest that the area within which the F statistics falls around the bounds will informed our decision of existence or no cointegration and results that falls within as inconclusive. Hence, the ARDL bounds test cointegration approach for the long run relationship between domestic debt, oil revenue, non oil revenue, total revenue and total expenditure is a new method for testing for cointegration, the study is also suitable based on the short span of data (Narayan, 2005).

Furthermore, the analysis focus on fiscal authorities' behaviour in executing government expenditure in financing government budgets, base on oil resource and due to, the dominance of the oil revenue in relation to other revenue. Similarly, coupled with the surges in overall government finances, warrant for the financing gaps to be filled in form of debt especially, domestic debt in this case from the debt market, which differs in the study of Mohammed were recourse is through printed money by the CBN which is inflationary prone. Koo (2008)

performed a similar study with data set for 1974-2006 for the case of South Korea using unit root showing an non sustainable condition.

This study invariably, engages the model which has been used in similar studies such as; Abdullah and Habibullah (2009) to assess the long run fiscal policy variables on economic growth to determine long run relationship amongst variables of external debt in Malaysia. The model 2 equation is tested base on our time series functional form Eq. 1

$$LDD = f(LOR, LNOR, LTR, LTX) \quad (1)$$

Hence, our basic fiscal model is specified as followed below;

$$\begin{aligned} \ln dd_t = & a_0 + \alpha_1 \ln or_t + \alpha_2 \ln nor_t \\ & + \alpha_3 \ln tr_t + \alpha_4 \ln tx_t + e_t \end{aligned} \quad (2)$$

RESULTS AND DISCUSSION

Descriptive data analysis: Descriptive statistics for the variables are presented in Table 1. Meanwhile, we proceeded to test for the unit root test using ADF and PP as a necessary but not sufficient condition as reported in Table 2. Table 1 shows the variables with respect to the first empirical model has 33 observation and 5 variables, with domestic debt DD as the dependent variable and non-oil revenue NOR, oil revenue OR, total revenue TR, and total expenditure TX as independent variables. The displayed figures show their mean, maximum, minimum and standard deviation values.

Unit root test: We proceeded to test the stationarity of the time series variables in order to investigate the properties of the series in our variables in this present study. This is to enable us obtained their proper form of integration, and consequently, we apply the superior and robust econometrics ARDL bound test procedure, which permits testing of series without determining first the order of the series, notwithstanding, our series are expected not to be integrated beyond I (2). However, the standard test for the unit roots was employed, accordingly by using the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests as earlier discussed. EViews Version 9.0 was used to perform these tests at automatic level set by the software.

The results as contained in Table 2 as shown below indicated all the variables included in the models were non-stationary at level in constant and exhibited no trend, and constant with trend involving ADF test until the series were first differenced. However, in the PP test, the

Table 1: Descriptive statistics

Variables	Observations	Mean	Maximum	Minimum	Std. Dev.
LOG(DD)	33	5.912381	8.870520	2.415253	1.956756
LOG(NOR)	33	4.658519	7.989751	1.093298	2.341279
LOG(OR)	33	5.818698	9.091441	1.981415	2.482715
LOG(TR)	33	6.099926	9.316217	2.352203	2.442015
LOG(TX)	33	5.643563	8.553587	2.265558	2.156119

variables used in the models were equally non-stationary at constant no trend, constant and trend except for oil revenue at constant LOR that was stationary at first difference. Meanwhile, all the remaining variables were all stationary at I (I).

Accordingly, in order to establish for cointegration testing of the relationship amongst the variables in the models, it became important to determine the appropriate lag length (k). Based on extant literature, for instance Pesaran *et al.* (2001), 2 lags are suggested for annual data. This study dealt with a sample size drawn from the period from 1981 to 2013 with 33 observation comprising 5 variables for the model.

Bound testing: Whereas, our bounds test cointegration is displayed in this dynamic functional equation:

$$\begin{aligned} \Delta dd_t = & \pi + \beta_1 dd_{t-1} + \beta_2 \ln or_{t-1} + \\ & \beta_3 \ln nor_{t-1} + \beta_4 \ln tr_{t-1} + \\ & \beta_5 \ln tx_{t-2} + \sum_{i=1}^p \alpha_1 \Delta dd_{t-2} + \\ & \sum_{i=0}^p \alpha_2 \Delta \ln or_{t-1} + \sum_{i=0}^p \alpha_3 \Delta \ln nor_{t-1} \\ & \sum_{i=0}^p \alpha_4 \Delta \ln tr_{t-1} + \sum_{i=0}^p \alpha_5 \Delta \ln tx_{t-1} \end{aligned} \quad (3)$$

The F-statistic tested the joint significance of the coefficients at one period of lag as shown in That is:

$$H_0 := \beta_1 \text{ and } \beta_2 = \beta_3 = \beta_4 \dots = \beta_5 = 0 \quad (4)$$

existence of long-run relationship:

$$H_0 := \beta_1 \text{ and } \beta_2 \neq \beta_3 \neq \beta_4 \dots \neq \beta_5 \neq 0 \quad (5)$$

non-existence of long-run relationship:

The idea for long-run relationship according to Paseran *et al.* (2001), the regressors are assumed to be integrated at I (0) for values at the lower bound whereas the upper bound values assumed they are integrated at I (1). The decision rule implies that our computed F statistic test value exceeds the upper bound value I (1) then we can conclude that domestic debt and its determinants are

Table 2: Result of the Unit roots test

Variables	ADF				PP				Decision
	Level		1st difference		Level		1st difference		
	Intercept	Intercept and trend	Intercept	Intercept and trend	Intercept	Intercept and trend	Intercept	Intercept and trend	
LDD	-1.345	-1.445	-4.266***	-4.307***	-1.345	-1.445	-4.266***	-4.307***	I(1)
LNOR	-0.449	-3.083	-7.182***	-7.043***	-0.449	-3.083	-7.182	-7.043***	I(1)
LOR	-1.350	-1.934	-5.019***	-5.147***	-1.350	-1.933	-5.147***	-5.147	I(1)
LTR	-1.303	-1.923	-6.243***	-3.419***	-1.302	-1.923	-6.243***	-3.419***	I(1)
LTX	-1.713	-0.387	-1.979	-4.489***	-1.713	-0.387	-1.979***	-4.489**	I(1)

The *** is at 1%, ** is at 5% and * is at 10% the number of lags was based on Automatic on SIC, maxlag 8

cointegrated. Contrarily when the computed F statistics falls below the lower bound value I (0) implies no cointegration. Furthermore, if the computed F statistics falls within the values of the bounds I (1) and I (0) would suggest that the result is inconclusive. In this study, the non-rejection of the null hypothesis that no long-run relationships exist so, we failed to accept the alternative at appropriate level of significance. Meanwhile, the result of the bounds test as presented in Table 1 showed that the model has no cointegrated relationship at 10, 5, 2.5, and 1% level of significance.

Result of the bound test: The descriptive statistics shows, that domestic debt is within the central mean and with a standard deviation that is perhaps within acceptable range given its low level of 1.957.

Findings from stationary test in respect of unit root shows that all the fiscal policy variables are stationary without unit root at both ADF and PP only at first difference. And the variables are all at constant and constant with trend. However, at PP except with the exception of LNOR which is not stationary at first different at constant but without unit root at first difference with constant and trend. The procedure is also meant to ensure that no variable is integrated beyond I (2) or more. The result are presented at Table 2

Interestingly however, the unit root tests suggest sustainability at first difference implying that the domestic debt is sustainable that government fiscal policy direction obeys IBC. In contrast, to the ARLD bounds cointegration test that shows no cointegration in the operation of government in its fiscal operation and therefore, implies cointegration test as a sufficient condition (Trehan and Walsh 1991; Wilcox, 1989). Therefore, domestic debt is not sustainable and in breach with IBC rule. From Table 3, the computed Wald test F statistic 1.856 fall below the lower bound of F critical values of both I (0) and I (1) at 10, 5, 2.5 and 1%. However, any value of F statistics which falls within the upper and lower bounds is considered inconclusive. Consequently, the result for bounds testing confirms the misleading nature of solely relying on unit root approach and the

Table 3: Analysis of wald test F statistics

Test statistic	Bounds	Level of significance			Decision	
F-statistic	Critical value%	10	5	2.5	1	
Value	1.856	I(0)	2.45	2.86	3.74	I(0)
K	4	I(1)	3.52	4.01	5.06	I(1)

Note. The critical values are taken from Narayan, (2005)

need for further cointegration as a sufficient condition. Furthermore, our findings reveal that government fiscal policy makers' behaviour does not show compliance in respect to IBC and if the policy stance remains may result to seriously implication to the economy. And further shows government revenue matters unlike other studies the focus more, on GDP to debt rather than on government revenue. This result support the position of Wilcox (1989) and Trehan and Walsh (1991) regards the biasness of relying on unit roots test and hence, suggested for a further cointegration test. Therefore, the need to subject the series to cointegration as a sufficient condition in order to determine the existence of or no cointegration in relation to government fiscal policy behaviour that revealed an unsustainable position based on our result. In this regards, the result shows that government may be relay the wrong signals to investors, credit rating agencies and other interested parties that government is not demonstrating enough commitment in meeting up its obligation to its creditor and may result to a negative implication to the economy.

CONCLUSION

This study assessed the sustainability of domestic debt and the nature, behaviour of policy maker's budget structure for Nigeria in connection to government revenue (oil and non oil) and expenditure. For instance, there has been a rapid build-up in domestic debt in recent time and the prevailing situation shows that the upswing may prevail for some time, given the persistent fall in price of crude oil at the international market and the implication on government revenue and fiscal budget on the economy. The study relied on and extended Hamilton and Flavin (1985) IBC framework using the ARDL bounds test cointegration technique in line with (Wilcox 1989; Trehan

and Walsh 1988). Whereby, they stressed for a cointegration methodology beyond the unit root approach. Hence, this study focuses on the fiscal years of 1981-2013 based on Narayan (2005) bound test cointegration for small sample size. Besides, there is the need to constantly gauge government finances periodically in relation with the domestic debt/borrowing in order to create awareness and build confidence in the debt market in order to avoid transmitting wrong signals regarding government fiscal operation in the economy.

RECOMMENDATIONS

Therefore, fiscal authorities must show commitment and vigour in pursuing diversification policy that will promote non-oil revenue and likewise, deploy innovative and strategic debt management policy that will promote sustainable stability in the debt market. Consequently, caution is required in the use of ratio in assessing sustainability which it is hardly static and is prone to swift changes.

In this connection, policy makers should initiate a prudent and efficient management of government revenue and expenditure that promotes accountability, transparency and healthy engagement between the public and other private sector stakeholders in the economic space.

By implication, government must demonstrate ability and discipline to not only service the interest on debt but equally, demonstrate capacity to repay the debt. Through the generation of enough surpluses revenue outside the oil resources that will eventually, balance the budget. Thus, rational economic agents might be unwilling to purchase government debt.

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