Modelling the Optimal Growth - Maximizing Public Debt Threshold: A Case for Kenya

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ABSTRACT

This paper attempts to estimate the optimal growth – maximizing public debt threshold for Kenya by assessing the relationship between public debt and economic growth. The analysis determines the tipping point beyond which Kenya's economic growth would be adversely affected. The paper thus contributes to the debate in Kenya on whether the move by government to take up huge bilateral and multilateral debt will in the long run be detrimental to the economy. A bilateral quadratic equation is used to fit the non - linear relationship.

The results confirm existence of a concave relationship between public debt and economic growth which is estimated to be optimal at around 45 to 50 percent for Kenya.

The policy implication for the analysis is the need to ensure that public debt management policies are in line with the growth – maximizing public debt threshold. This will ensure sustained economic growth and employment rates, which are key tenets for sustainable economic development.

Key Words: Public debt threshold, growth maximizing, Laffer curve

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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CHAPTER ONE: INTRODUCTION

1.1. Background

Kenya's public debt has tripled in a span of seven years. Debt data from the Central Bank of Kenya shows that in January 2012 Kenya's approximate public debt was KSh1.5 Trillion and shot to KSh5.8 Trillion in December 2018. Moreover, Kenya's external to domestic debt ratio has changed from 59 : 41 in 2002 to 51 : 49 in 2018 which is against the debt strategy target mix of 40 : 60, (The National Treasury, 2018, p. 5). In as much as the proportions of Kenya's external and domestic debt to its total debt ratios has decreased by 8 per cent and increased by 8 per cent respectively from 2002 to 2018, the fact that we are borrowing way more than our external target mix, is of concern. Kenya's investors are not only being crowded out but also; Kenya as a country is exposing itself to high currency risk.

Moreover, Kenya's composition of multilateral debt has significantly decreased from 64 per cent in June 2013 to 34 per cent in June 2018, (Owino & Mutua, 2019). Over the same time span, Kenya increased its bilateral debt proportion from 27 per cent to 31 per cent and commercial banks debt proportion from 7 per cent to 34 per cent, (Owino & Mutua, 2019). The country has moved to more expensive creditors with pressurizing payment terms such as having short maturity periods for huge chunks of debt. In addition, Kenya is not diversifying its bilateral debts. As of 2018, it owed China KSh634.4 Billion and just KSh104.7 Billion to Japan which is the second ranked bilateral creditor to Kenya; a gap of KSh529.7 Billion for Kenya's top two bilateral lenders.

Kenya's outstanding domestic debt as at the 2017/2018 Financial Year end was approximately USD 21 Million, (The National Treasury, 2018, p. 12). Regardless, Kenya continues to borrow to service previous debt. Recently, Kenya raised KSh210 Billion in a third Eurobond loan issue; a substantial amount of which will be used to refinance part of its outstanding debt, (Mwaniki, 2019). Given the

above phenomenon it is clear that Kenya is struggling to maintain its status quo as a good debtor.

Kenya's Gross Domestic Product, GDP has ranged from 5.9 per cent, 4.9 per cent and 6.3 per cent in 2016, 2017 and 2018 respectively; a good trend which partly saw Kenya move to a Lower Middle Income country from a Low Income country, (Odhiambo, 2015). However, the country's budgeted expenditure is heavily on recurrent expenditure than on capital expenditure, (IEA - Kenya, 2018, p. 7) and yet is expected to service its debt in the process. This signals a problem.

1.2. Problem Statement

Is there an optimal government debt threshold above which growth is drastically compromised? Research by IMF (2014, p. 14), has shown no clear evidence of such existence but was challenged by Reinhart & Rogoff (2010, pp. 1 - 3), who found that for both advanced and emerging economies, public debt that exceeds 90 per cent of GDP is pegged to deterioration of real average GDP growth rates; more specifically a -1 per cent real growth rate.

They further discovered that when external debt reached 60 per cent of GDP, annual economic growth declines by 2 per cent for emerging markets and cuts into half for advanced economies. In the contrary, Herndon, Ash, & Pollin (2013, pp. 1-3), claimed that a public debt of 90 per cent of GDP leads to a lower real average GDP growth rate but of 2.2 per cent.

Additionally, they argued that the 2.2 per cent growth rate is found after using contrasting data weighting from Reinhart & Rogoff (2010) and rectifying the syntax errors. More research found a non - linear relationship between debt and GDP; that is, high levels of initial public debt are associated with low levels of growth subsequently, (Kumar & Woo, 2010, p. 4) which is consistent with the existence of a debt to GDP threshold.

As of 2017, Kenya's debt to GDP ratio has been 56.2 per cent, (The National Treasury, 2018, p. 48) and is estimated to even go higher in the subsequent years. This research thus estimates a debt threshold above which Kenya's economic growth would deteriorate. Debt can only contribute to an economy's growth up to a certain point. This estimation would hence inform decisions regarding public debt by the Kenyan government by ensuring that public debt management policies are in line with the growth – maximizing public debt threshold. This will ensure sustained economic growth and employment rates, which are key tenets for sustainable economic development.

1.3. Research Objectives

i. Model Kenya's optimal growth - maximizing public debt threshold.

ii. Determining whether or not there exists a non – linear relationship between public debt and economic growth.

1.4. Research Questions

i. At what level is more debt a drag on Kenya's economic growth?

ii. Does economic growth and public debt exhibit a non – linear relationship?

1.5. Importance of the Research

Debt contributes to economic growth up to a certain threshold which this study intends to establish and hence will be a basis for decisions on the amount of public debt to take up that would not be detrimental to the Kenyan economy in the long run.

Furthermore, the level of optimal debt threshold is influenced by the level of taxation. Therefore, in as much as a government cuts down on borrowing, it should be cognizant not to increase taxes too much to the extent of crowding out investment which is one of the vectors for economic growth.

1.6. Scope of the Research

This research is only subject to the Kenyan economy and limited to its public debt and GDP.

CHAPTER TWO: LITERATURE REVIEW

2.1. Theoretical Literature Review

Economic growth is the rise in an economy's capacity to produce goods and services compared from one period to another, (Aghion & Howitt, 2009). Public debt is an accumulation of domestic and external borrowing by a nation to fund its public spending other than through taxation, (Matiti, 2003). Therefore, prudent management of public debt contributes positively to economic growth and stability by limiting financial risk; which is the possibility that an economy would lose money as a result of debt; and mobilizing resources with low borrowing costs, (Matiti, 2003, pp. 3-4).

Excess debt leads to negative externalities on an economy such as debt overhang. An example is Sri Lanka which had to lease Hambantota Port situated on its southern coast to China for 99 years in 2017 since it was unable to service its debt, (Kiran, 2017).

Debt relief is another negative externality to an economy. In 1996, the World Bank and International Monetary Fund jointly came up with the Highly Indebted Poor Countries, (HIPC) Initiative and later in 2006 enhanced it to the Multilateral Debt Relief Initiative, (MDRI) whose goal was to help poor states grow to their sustainable levels and attain the Millennium Development Goals (MDGs), (IMF, 2014, pp. 3-5).

Debt relief to debt overhang economies stimulates growth through increased incentives to invest and new potential capital inflows. Checherita & Rother (2010, p. 8), further explained that, public debt and economic growth exhibit a non - linear relationship. Subsequently, there exists a threshold beyond which more debt is detrimental to an economy. This claim would therefore support debt reliefs since they reduce an economy's outstanding debt to sustainable levels hence promote economic growth. Should we really encourage debt reliefs? A debtor's reputation is negatively affected by debt reliefs because of the

uncertainty it brings about a country's future debt service payments in international financial markets; this would hence dampen investment efforts in the country, (IMF, 2014).

Further research by Reinhart & Rogoff (2010, pp. 1-3), supports the notion that economic growth and public debt manifests a non - linear relationship and a consensus that the relationship is dependent on an economy's level of debt. Further explanations are made of the debt Laffer curve which was introduced by Jeffrey Sach in 1989 to show that, the more debt an economy takes up, the higher the probability of defaulting on debt obligation. The original Laffer curve was an idea of Arthur Laffer whereby he explained the relationship of tax rates and government revenue. Taxes contribute to government revenue up to a certain point beyond which they become an expense to the economy.

Taxes and debt are both sources of government revenue. This research thus concurs with Husain (1997, pp. 519-521), who argues that, if a country is on the wrong side of the Tax Laffer Curve, then it must be on the wrong side of the Debt Laffer Curve; following that government debt and taxation are two of the basic instruments for financing public expenditures.

Knowledge of Kenya's public debt threshold will further facilitate the move for optimal public debt management by reducing the overall tax burden adverse fiscal shocks as well as stabilize the Kenyan economy against financial shocks.

It is a puzzle that most economies in the world do not index government debt despite the proposition being from economists, (Alfaro & Kanczuk, 2007, p. 1). Arguments for indexation claim that it eliminates the incentive for governments to inflate the economy to evade the real cost of nominal liabilities. Nominal debt on the other hand creates room for government to hedge against unexpected fiscal shocks and hence prevent future tax distortions, (Bohn, 1988). Furthermore,

government funding covaries with inflation. Nations should weigh the benefits and costs of either and make a welfare maximizing decision.

2.2. Empirical Literature Review

Reinhart & Rogoff (2010), argue that countries seldom grow their way out of debt. They further use a panel data of 44 countries for a period of about two centuries given data on debt, inflation and growth to explain that as countries hit debt intolerance ceilings market interest rates could begin to rise, hence forcing painful adjustments. Their main finding was that for advanced economies, a high debt to GDP ratio of more than 90 per cent results in low economic growth and so does a 60 per cent threshold for emerging economies.

Similar findings by Checherita & Rother (2010), revealed a non - linear relationship between public debt and economic growth after carrying out a panel regression analysis for a period of 38 years using 12 European countries. Although Reinhart & Rogoff (2010), were criticized by Herndon, Ash, & Pollin (2013), on the basis that their analysis had syntax error, insignificant changes of their results were observed. More evidence of non-linearity of public debt and economic growth by Kumar & Woo (2010), using data ranging from 1970 to 2007 found that for advanced economies a 10 per cent increase in debt to GDP ratio is associated with a 0.15 per cent decrease in economic growth.

2.3. Research Gap

There have clearly been several growth maximizing public debt thresholds hence there is room for robust research. Moreover IMF (2010), claim that the non - linear relationship is not ground on robust empirical evidence. This is thus the genesis of this study; to further research on the existence of a growth maximizing public debt threshold narrowing it down to the Kenyan context.

CHAPTER THREE: METHODOLOGY

3.1. Introduction

The study seeks to determine whether there exists a non - linear relationship between public debt and economic growth. Therefore, an econometric analysis of economic growth and public debt is used that estimates a model relating economic growth to public debt and other explanatory variables. In addition, a bivariate quadratic growth equation is estimated with the approach from Checherita & Rother (2010, p. 13).

3.2. Research Design

This study estimates a bivariate quadratic growth equation with explanatory variables expressed as a percentage of Kenya's GDP.

The dependent variable in question is Kenya's economic growth. Samples of; Trade Openness, Gross National Expenditure, Savings and Public Debt (External plus Domestic) are used as the independent variables for a period of 17 years.

The stated explanatory variables include the components of aggregate demand which in theory infers economic growth. However, since the aim of this paper is not to estimate the factors affecting economic growth but rather the public debt threshold beyond which economic growth would deteriorate, this study uses a bivariate quadratic equation which incorporates Public Debt Squared.

3.3. Research Model

3.3.1. Model Specification

The model in question is thus specified in equation (1) as:

$$Economic\ growth_t = \beta_0 + \beta_1 Public\ Debt_t + \beta_2 Public\ Debt_t^2 + \beta_3 Trade\ Openness_t + \beta_4 Gross\ National\ Expenditure_t + \beta_5 Savings_t + e_t \quad (1)$$

Where:

- Trade Openness is the sum of the ratio of total exports and imports of a country to GDP. Therefore, exposes a country to external shocks which would affect its economic growth.
- Gross National Expenditure is the sum of household final consumption expenditure (formerly private consumption), general government final consumption expenditure (formerly general government consumption), and gross capital formation (formerly gross domestic investment).
- Savings is comprised of Gross National Income, GNI plus net transfers less total consumption.

The independent variables are conveyed as a percentage of GDP. These variables have been found to be statistically significant in explaining economic growth in empirical literature by Checherita & Rother (2010).

This paper does not seek to determine the drivers of economic growth but rather use the relationship between public debt and economic growth to model the optimal growth maximizing public debt threshold.

3.3.2. Estimation Method

This model uses Generalized Method of Moments estimation criteria to deal with the problem of endogeneity that would lead to inconsistent estimates of the coefficients of the independent variables. This also solves the possibility of

reverse causality between public debt and economic growth. The Hansen's J statistic test is used to check for robustness.

3.3.3. Data and Data Sources

This research uses Time Series annual datasets of; Total Public Debt, Trade Openness, Gross National Expenditure and Savings as a percentage of GDP retrieved form the World Bank Database and the Central Bank of Kenya Statistics Database.

This study goes ahead to uses a window of 17 years; from 2001 to 2017 with the aim of capturing Kenya's different but recent presidential regimes.

CHAPTER FOUR: DATA ANALYSIS

4.1. Descriptive Statistics

Key to note is that seventeen observations are used for the analysis because most of the data on key variables from the World Bank Database was annual. Timeseries analysis require a minimum of fifty observations but since Table 3 below indicates a lag length of zero the analysis will be based on a simple regression equation.

The descriptive statistics of the data is as shown below.

Table 1: Descriptive Statistics

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Observations**
GDP Growth Rate	4.82	5.36	8.41	0.23	2.13	17
Total Debt to GDP	0.48	0.45	0.60	0.37	0.08	17
Gross National Expenditure to GDP	112.22	111.73	116.22	109.21	2.16	17
Trade Openness to GDP	53.12	54.23	64.48	37.49	7.31	17
Savings to GDP	12.40	12.34	16.66	8.53	2.48	17

Source: Researcher's own computations based on World Development Indicator's Database (World Bank 2019) and the Central Bank of Kenya Statistics Database

4.2. Stationarity Tests

The need for stationarity tests is to check the extent to which the data's statistical properties are changing over time. An Augmented dickey – Fuller test is done at set maximum lags of two using the E – Views software.

The results indicate that GDP Growth Rate, Total Public Debt to GDP Ratio and Savings to GDP are stationary at level; Gross National Expenditure is stationary after first difference while Trade Openness is stationary after second difference as shown in Table 2.

Figure 1 below depicts no trend by all variables. A trend term was thus not included in the Augmented Dickey Fuller tests.

Figure 1: Graphical Representation of Regression Variables

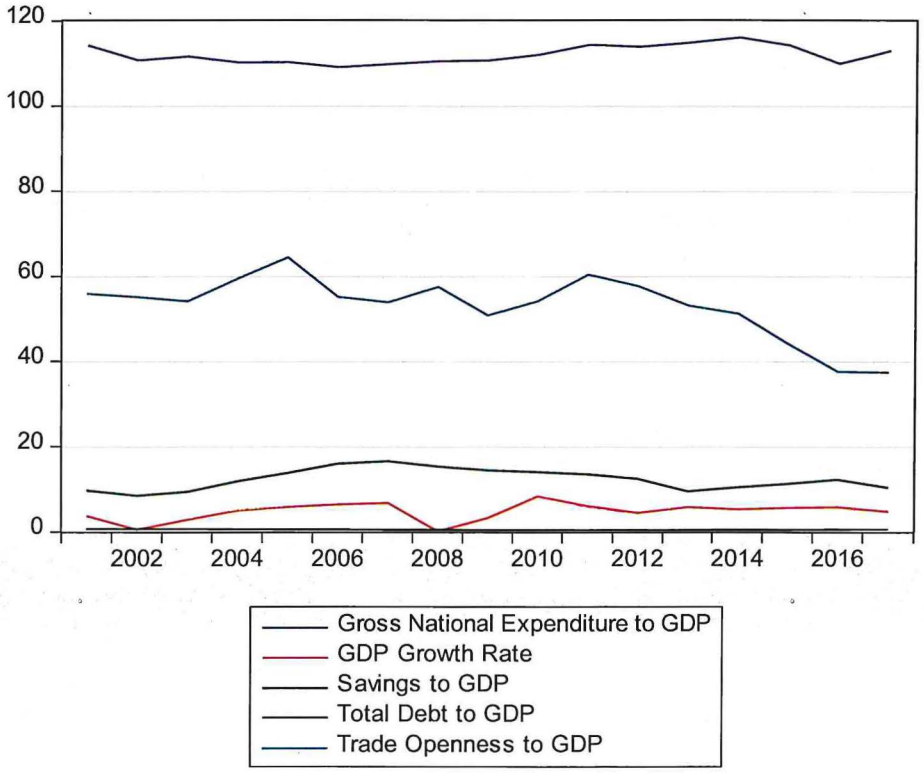


Table 2: Results of Unit Root Tests

	Augmented Dickey - Fuller Test		
	Level	First Difference	Second Difference
GDP Growth Rate	1.167256 (0.0010)	-	-
Total Public Debt to GDP Ratio	-0.301224 (0.0472)	-	-
Savings	-0.344542 (0.0301)	-	-
Gross National Expenditure	-0.426873 (0.0617)	-1.182267 (0.0007)	-
Trade Openness	-0.446381 (0.4539)	-1.355900 (0.0553)	-2.182486 (0.0388)

4.3. Lag Length Selection

Using the Akaike Information Criterion, a lag length of zero is selected after excluding the non - linear component as an exogeneous variable. Therefore, the model will have an intercept but no lags; a simple regression will be estimated.

The order of the variables used was one that depicted the variables' stationarity.

Table 3: Lag Length Selection

VAR Lag Order Selection Criteria

Endogenous variables:

GDP_GROWTH_RATE

Exogenous variables: SAVINGS_TO_GDP D(TRADE_OPENNESS_TO_GDP,2) D(GROSS_NATIONAL_EXPENDITURE_TO_GDP,1) TOTAL_DEBT_TO_GDP

Date: 11/26/19 Time: 16:59

Sample: 2001 2017

Included observations: 13

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-26.64959	NA*	6.672856*	4.715321*	4.889151*	4.679591
1	-26.62542	0.029743	7.919053	4.865449	5.082737	4.820787
2	-24.77642	1.991227	7.187973	4.734834	4.995580	4.681239
3	-23.74746	0.949813	7.534941	4.730378	5.034582	4.667851*
4	-23.59584	0.116627	9.275137	4.860899	5.208560	4.789439

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

4.4. Model Estimation

The Two Stage Generalized Method of Moments (GMM) is used over the one stage GMM because it assigns high weights to low variance and low weights to high variance thus attaining Minimized Sum of Squared Errors. It is also used over the Instrumental Variables technique because it caters for all available orthogonal conditions hence is better at dealing with endogeneity. The first lags of the level or n difference; D(x, n); of the respective variables were used as external instruments. The decision to use levels or lags on the various variables was based on the unit root tests shown in Table 2 above.

All coefficients are significant given a null hypothesis of the error terms not being related to the instruments; which depicts validity of instruments; using a P – Value of 0.05. That is:

Ho: Restrictions are valid

Ha: Restrictions are invalid

A positive autocorrelation is observed given a Durbin Watson (DW) Statistic of 1.82. Given that a DW Statistic of 2 depicts no autocorrelation our model has dealt with autocorrelation though not to its entirety.

The Hansen J statistic; 0.100496; which is a test of overidentified restrictions finds the instruments as valid since the paper fails to reject the null.

A low R Squared of 5.26 percent is observed because as earlier stated the aim of this paper is not to determine the factors affecting economic growth in Kenya but rather the public debt to GDP threshold. Therefore, some factors are obviously omitted hence the assumption that endogeneity is present in all variables which was dealt with by using their deeper lags. Specifically, the differenced variables of Trade Openness to GDP and Gross National Expenditure to GDP would cause endogeneity by construction.

Table 4 below details the above.

Table 4: Model Estimation

Dependent Variable: GDP_GROWTH_RATE

Method: Generalized Method of Moments

Date: 11/26/19 Time: 16:37

Sample (adjusted): 2003 2017

Included observations: 15 after adjustments

Estimation weighting matrix: Two-Stage Least Squares

Standard errors & covariance computed using estimation weighting matrix

Instrument specification: GDP_GROWTH_RATE(-1) TOTAL_DEBT_TO_GDP(-1) (TOTAL_DEBT_TO_GDP^2)(-1) SAVINGS_TO_GDP(-1) D(GROSS_NATIONAL_EXPENDITURE_TO_GDP,1)(-1) D(TRADE_OPENNESS_TO_GDP,2)(-1)

Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TOTAL_DEBT_TO_GDP	40.25620	22.22037	1.811680	0.1001
TOTAL_DEBT_TO_GDP^2	-49.12678	30.54247	-1.608475	0.1388
SAVINGS_TO_GDP	-0.208120	0.309348	-0.672770	0.5163
D(GROSS_NATIONAL_EXPENDITURE_TO_GDP,1)	-0.173374	0.354355	-0.489265	0.6352
D(TRADE_OPENNESS_TO_GDP,2)	0.061581	0.092201	0.667893	0.5193

R-squared	0.052639	Mean dependent var	5.171924
Adjusted R-squared	-0.326305	S.D. dependent var	1.910130
S.E. of regression	2.199808	Sum squared resid	48.39153
Durbin-Watson stat	1.819816	J-statistic	0.100496
Instrument rank	7	Prob(J-statistic)	0.950994

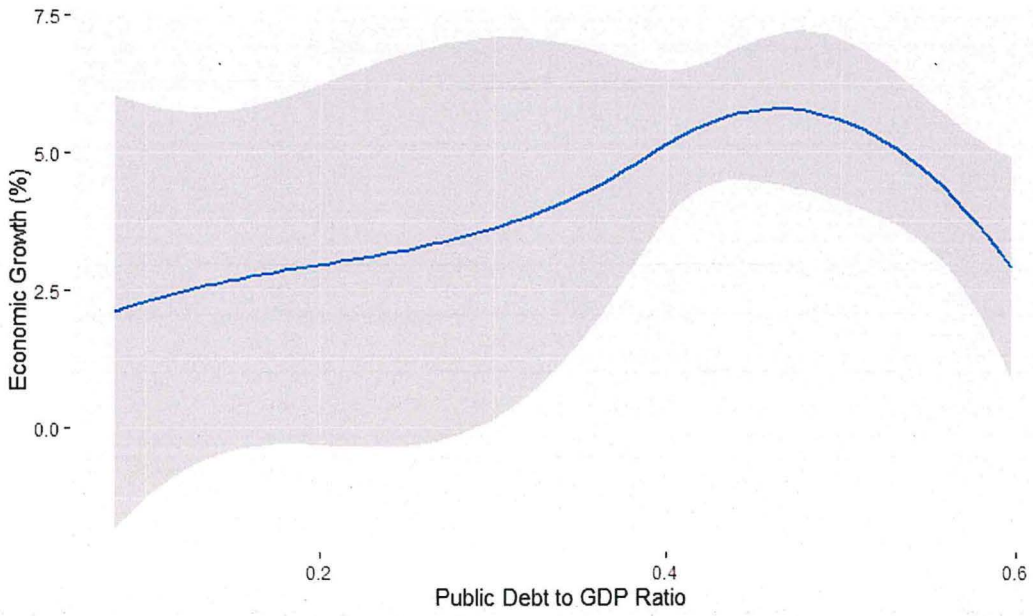
4.5. Kenya's Public Debt to GDP Threshold

A threshold range of 40 per cent to 50 per cent of public debt to GDP ratio of Kenya is observed. This range is thus optimal because, an increase in public debt to GDP ratio by one point, does not yield neither a very high nor a very low increase in the value of economic growth.

Further, a non - linear relationship between public debt and economic growth exists and hence this paper discredits the notion of its inexistence, IMF(2014, pg.14).

The analysis was carried out in R software.

Figure 2: Kenya's Public Debt to GDP Threshold



CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

This paper analyzes the optimal public debt to GDP ratio for Kenya by assessing the relationship between public debt and growth. The analysis determined the tipping range of points beyond which Kenya's economic growth would be adversely affected. The paper thus contributes to the debate in Kenya on whether the move by government to take up huge bilateral and multilateral debt will in the long run harm the economy. A bilateral quadratic equation is used to fit the non - linear relationship.

The results confirm existence of a concave relationship between public debt and economic growth which is estimated to be optimal at around 45 per cent to 50 per cent for Kenya. These results are consistent with empirical evidence by (Kumar & Woo, 2010) and (Reinhart & Rogoff, 2010).

The paper recommends public debt management policies in line with the growth – maximizing public debt threshold which include reduction in debt accumulation by the Kenyan government to cater for recurrent expenditure but rather more for capital expenditure. Still, should be monitored to avoid cases of debt overhang, (IMF, 2014).

The research can be further extended by utilizing other approaches to identifying the optimal threshold of public debt to GDP ratio such as the debt intolerance approach as advocated by, (Reinhart & Rogoff, 2009).

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