THE NON-LINEAR EFFECT OF HIGH AND GROWING EXTERNAL DEBT ON KENYA'S ECONOMY

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Abstract

The developing economies in Africa experience shortfall in revenue generation and therefore unable to supplement their development expenditures, they resort to seeking external funding. External debt in Kenya has risen sharply to a tune of Kshs 2.3 Trillion as at 2017 relative to stagnant economic growth overtime.IMF report indicates that Kenya has exceeded the generally accepted debt to GDP ratio of 50 percent as of February 2018 by 6.2%. Additionally, the credit rating of Kenya has been downgraded from B1 to B2 ratings, implying that the country is rated highly speculative and that adverse financial or economic conditions may render the country incapacity to meet its financial obligations. The objective of this study was to assess the non-linear effect of external debt on Kenya's economy. The study adopted time series data for the period 1970 to 2017 in Kenya. Time series property tests suitable for the non-linear model were conducted before running the Generalized Method of Moments (GMM) to achieve the objective of the study. The study established that external debt in Kenya has a positive contribution to economic growth, albeit up to a point beyond which more debt starts to drag the economy.

Keywords: Nonlinear, External Debt, Economic Growth, Debt Threshold, Laffer Curve

INTRODUCTION

External debt is one of the sources of financing capital formation in any economy (Bökemeier & Greiner, 2017). Developing countries in Africa are associated with insufficient internal capital formation due to the vicious circle of low productivity, low income, insufficient revenue collected and low savings (Adepoju, Salau & Obayelu, 2007). Such economies face a fiscal discrepancy mainly driven by external debt servicing and widening of current account deficits (Reinhart & Rogoff, 2013). This situation calls for managerial, technical, and financial aid from Western countries to bridge the resource gap.

According to Arnone and Presbitero (2016), excessive external debt acts as a major limitation to capital formation in developing nations; it may generate a low-profit rate and a low rate of capital accumulation in the long-run, characterizing a macroeconomic stagnation. Large external debts compress public expenditures and affect the mix of public spending on growth and welfare effects. However, it might encroach on social expenditures because of fiscal adjustments and public expenditures reductions aimed at honoring debt obligations and because of inadequate room for future external financing (Lora & Olivera 2007).External debt might encourage investments and economic growth only in countries with a sound institutional framework, while where institutions are weak and have bad policies then; debt might hinder investment and growth (Arnone & Presbitero, 2016).

Developing nations in Sub-Saharan Africa sustain their economies through foreign aid. The escalating fiscal debt needs to be controlled to avoid crowding out effect (Afonso & Sousa, 2012). In order to reduce the debt, the countries are faced with the challenges of increasing revenues, decreasing non-essential public expenditure and expanding avenues for new investment that can drive these economies to higher growth while reducing the current account deficit to sustainable levels (Baum, Poplawski-Riberio & Weber, 2012).

Countries may have huge external debt along with a relatively higher level of exports that can help them to sustain their level of external debt. However, external debt if not sustainable, imposes a higher risk to the economic prosperity, since servicing it may lead to debt overhang in a country (Panizza & Presbitero, 2014). Group of scholars argues that external debt will have a positive effect on economic growth since it expands capital inflow (Edwards, 2009). If channeled to growth allied expenditures, foreign debts can fast-track economic growth. Apart from providing foreign capital for industrial development, foreign debt also offers managerial expertise, know-how, technical skills and entry to foreign markets for the mobilization of a nation's human and material resources (Reinhart, Carmen, Vincent & Kenneth, 2012).

However, when external debt accumulates beyond a certain threshold, there will be a structural break in the economy where investment will be adversely affected. This leads to

negative relationship commonly referred to as debt overhang. Debt overhang theory highlights that high levels of indebtedness depresses investment and adversely affect growth as future tax revenues will be channeled to settle the debt (Baum, *et al.* 2012).

Sustainable economic growth is a predominant concern to all economies (Shabbir, 2012). The most effective tool for economic growth is sound macroeconomic policies focusing on both private and public investment to generate wealth, increase productivity, national income and employment, reduce inflation, and finance public service provision (United Nations, 2007). However, most countries rely on debt to finance economic growth and expansion (Boboye and Ojo, 2012) making debt one of the key economic issue affecting the economies of today.

Overview of External Debt in Kenya

Kenya being the developing country compliments its revenue through exports of primary commodities (unprocessed). In an attempt to add to the available resources, successive governments have acquired huge sums of external debt to finance national development plans. A number of projects in Kenya comprising of the standard gauge rail line, Mombasa port terminal, Oil pipeline, and KenGen *inter alia* have been financed through external debt(The National Treasury of Kenya, bulletin 2016).

The government of Kenya in June 2014 floated a $2 billion (Sh207.4 billion) sovereign bond on the Irish bourse and later in December 2014 went back to the market for a further $750 million (Sh77.8 billion) in what is referred to as a tap issue. The first use of the Eurobond was to retire a costly $604.5 million (Sh62.7 billion) syndicated loan Kenya had loaned from commercial banks in 2012 to fund development projects. Additional $1.39 million (Sh144.1 million) was forked out of the bond as expenses relating to transaction advisory fees, federal taxes, and bank charges. This meant that Kenya received $2.21 billion (Sh229.2 billion) as net proceeds from the Eurobond to finance mega public projects (The National Treasury of Kenya, 2016).

Table 1: External debt structure in Kenya

Source	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Bilateral	27.9%	30.7%	25.8%	31.1%	25.4%	31.49%
Multilateral	63.0%	60.5%	51.8%	48.4%	47.7%	36.81%
Suppliers-credits/ Commercial debts	9.1%	8.8%	22.4%	20.5%	26.9%	31.70%
Foreign-Financial Institutions	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: The National Treasury of Kenya

Kenya's external debt is composed of bilateral and multilateral debts constituting more than 70 percent of the entire external debt, with suppliers' credits and commercial debts contributing the

remaining portion. Multilateral and bilateral debts are development oriented and most suited form of external debt for developing economies, luckily it constitutes the largest portion of external debt in Kenya (Mogaka, 2017). Conversely, this is a reduction from 90 percent in April 2010 beckoning adrift from this form of credit. The Exim Bank of the US and China Import-Export Bank are among the supplier's credit. The risk associated with this form of tied credit is that even when quoted interest rates are low, the prices might be inflated since there is no room for a competitive tendering process (Mogaka, 2017).

Commercial debt is the most sensitive, risky and expensive form of external debt (Melina & Zanna, 2016). Commercial dealings are profit driven and associated with high premiums, often tied to the credit rating of the country, characterised by short tenors since longer maturities would carry higher risk and hence higher rate of credit. Such credit is unsuited to infrastructural projects that carry long gestation and low returns. The Eurobond issued in June 2014 was a commercial debt with an average tenor of 8.75 years and average interest rate of 6.625 percent per year. Commercial debt profile of external debt for Kenya seems to be rising overtime recording 31.7 percent of the total external debt as at June 2017 (Mogaka, 2017).
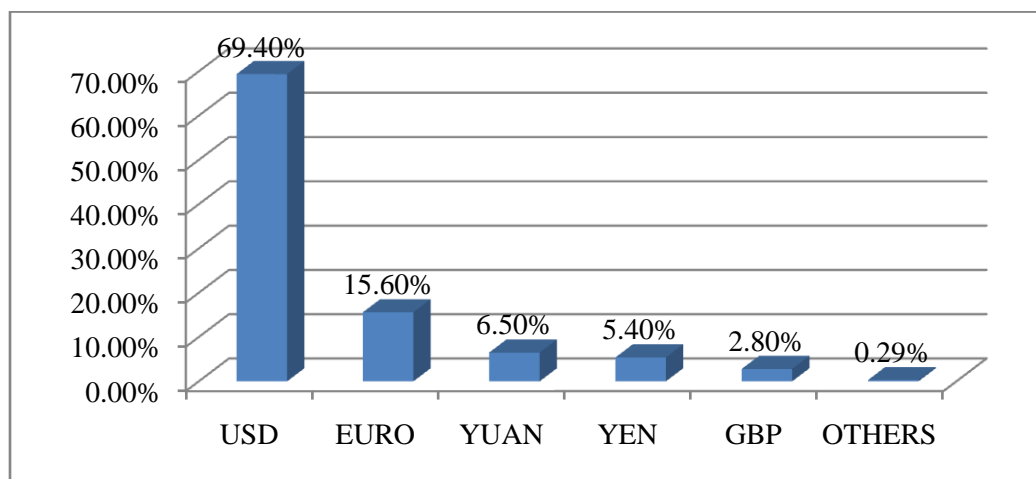

Figure 1: Currency composition of External Debt in Kenya

Source: National Treasury Bulletin, 2018

The currency composition of external debt to Kenya is relatively diverse. According to the National Treasury Public Debt Report of Kenya, as at the end March, 2018 the currency composition of the external debt stock mainly comprised the United States Dollar (USD), Euro, Chinese Yuan, Japanese Yen and Sterling Pounds (GBP accounting for 69.4 percent, 15.6 percent, 6.5 percent, 5.4 percent and 2.8 percent respectively while other currencies accounted for 0.29 percent of the portfolio. The currency mix reflects the source of funding but not the

outcome of a debt management strategy. A diversified currency mix mitigates exchange rate risks on external debt. Additionally, assessing the external debt structure for Kenya, the study categorizes time to debt maturity into short term, medium term and long term.

Table 2: Outstanding External Debts by Maturity Structure in Kenya

Remaining maturity	June 2012	June 2013	June 2014	June 2015	June 2016
1-4 years	6.6%	7.9%	14.7%	8.2%	11.4%
5-10 years	15.8%	16.9%	22.9%	25.5%	24.7%
Over 10 years	77.6%	75.3%	62.4%	66.3%	63.9%

Source: The National Treasury of Kenya

It can be noted that the external debt with a maturity of more than 10 years has been declining while the category of debt between 1-10 years has been rising, indicating the hardening of average external debt terms. Longer average term-to-maturity of loans allows the government more time to repay its debts. As of June 2017, net charges on external debt servicing grew by 37.3 percent to Kshs 107.2 billion.

Overview of Economic Growth in Kenya

Kenya stimulated swift economic growth through public investment after attaining its independence. This was done by encouraging small-holder agricultural production, manufacturing and incentives for a private sector often foreign industrial investment and also a cautious financial policy were pursued which ensured external debt and inflation was maintained within manageable levels to circumvent disequilibrium in the balance of payment (Chege, Ngui & Kimuyu, 2014).
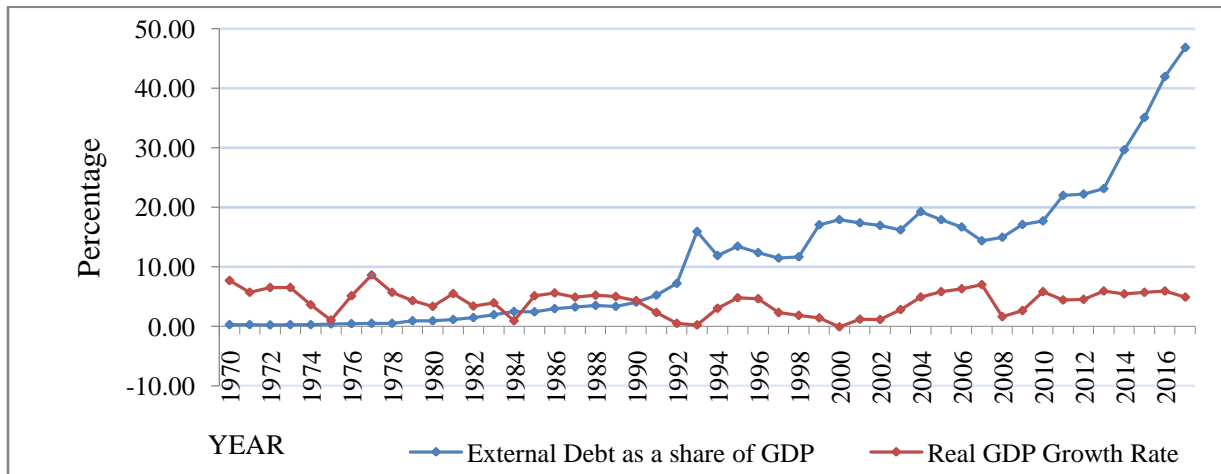

Figure 2: Economic growth and external debt as a share of GDP in Kenya

Source: Kenya National Bureau of Statistics (KNBS)

Kenya's economic performance declined amid 1974 and 1990 with GDP growth averaging 4.2 percent per year in the 1980s and 2.2 percent per year in the 1990s (Kimenyi, et al. 2015). External debt was kept low during this period, for instance, debt service charges on external debts in 1976/7 amounted to less than 4 percent of government expenditure, to 1 percent of monetary GDP, and to 2.3 percent of the value of exports (Fahnbulleh, 2006).From 1991 to 1993, Growth in GDP deteriorated, and agricultural production shrank at a yearly rate of 3.9 percent. Inflation reached a record 100 percent in August 1993, and the government's budget shortfall was over 10 percent of GDP. As a result, multilateral and bilateral creditors suspended program aid to Kenya in 1991 (Osoro, 2016). The debt had reduced between these periods following the debt forgiveness which started in 1992 (Onyango, 2014).

In 1993, the Government of Kenya began a key program of economic reform and liberalisation. A new governor of the Central Bank and a new minister of finance commenced a series of economic measures with the help of the International Monetary Fund (IMF) and the World Bank (Banutu-Gomez, 2011). In line with the program, the government removed price controls, foreign exchange controls and import licensing, privatised an array of state-owned companies, cut the number of civil servants, and announced conservative monetary and fiscal policies.

In 1997 the economy entered into a period of stagnant/slow growth, owing in part to hostile weather conditions and less economic activities before general elections in December 1997 (Banutu-Gomez, 2011). In July 1997, the Government of Kenya declined to fulfill pledges made earlier to the IMF on governance reforms (Mugoti, 2009) forcing IMF to suspend advancing for three years, and World Bank also putting a $90 million structural adjustment credit on hold (Ebizguides, 2007). In 2000, real GDP growth rate dropped to –0.5 percent as a result of weak macroeconomic performance and governance-related problems, which continue to derail Kenya relations against the major international donors, thus, denying the country the much desired external inflows (O. E. C. D., Organisation for Economic Co-operation and Development Staff, and Centre, 2002). The external position of the country continued to worsen as a widening trade shortfall, occasioning from poor export performance, debt burden ratio stood at 131.8 percent (Onyango, 2014). In July 2000, IMF and World Bank signed a $150 and a $157 million respectively for Poverty Reduction and Growth Facility and Reform kit (Ebizguides, 2007).

The period 2003-2008, the country experienced a rising economic growth from 2.9 percent in 2003 to 7.1 percent in 2007. The ratio of debt-GNP falls to 34.98 percent and the ratio of debt-export falls to 132.43 percent on average relative to other periods following reform programs initiated by the new government; such as infrastructure and social sectors including

education, health, economic affairs, defense, public order and national security (Maingi, 2011). In 2007 the real GDP reached 7.1 percent. The service sector, led by the telecommunications and tourism sectors were among the key drivers of growth, showing better employment rate (Kitiabi, 2011).

In 2007, FDI was at $729m and dropped almost 75 percent to $183m in 2008 after the election violence. Kenya's falling growth of 7.1 percent in 2007 to 1.7 percent in 2008 was compounded by high inflation, with headline inflation of 25.8 percent in March 2009 while underlying inflation rose above the 5 percent target to reach 9 percent with declining revenues of 456 Billion in 2009 (KRA Financial report, 2009/2010) pointing to the election violence of 2008. The period between 2008-2017, GDP Annual Growth Rate in Kenya averaged 5.44 percent from 2004 until 2017, reaching an all-time high of 12.40 percent in the fourth quarter of 2010 and a record low of 0.20 percent in the fourth quarter of 2008 (KNBS, 2017).

It is evident that growth has not been linear despite the continuous increase in external debt over time. This suggests that the debt-growth nexus is non-linear. *Figure 2* shows a non-linear movement of economic growth over time and external debt as a share GDP rising consistently. Both positive and negative effects can be seen in economic trend curve above, implying that there exist two conflicting effects of external debt that work interactively, hence the presence of non-linear effect on the growth of an economy as a result of growing debt.

Statement of the Problem

The Cytonn Investment report (2018) revealed that Kenya's entire debt burden has been rising gradually by 22.2 percent yearly to reach Sh4.6 trillion November 2017. Several development projects in Kenya are being financed by external debt. According to BMI research (2017), mega expansion projects ongoing in Kenya are projected to enhance the economic growth of the country by 8.7 percent. Conversely, according to KNBS (2018), economic growth rate as at 2017 seem to have stabilized at 5 percent despite the rising debt acquired by the country. External debt servicing has been escalating standing at 37.3 percent and the ratio of external debt servicing charges to foreign exchange earnings from exports, an indicator of the economy's ability to service external debt, recording 9.9 percent as at June 2017.

The internationally accepted level of debt to GDP ratio is 50% according to IMF frontier economies. As of February 2018, Kenya was above the threshold by 6.2 percent. According to International credit rating agency 2018, Kenya's sovereign rating was downgraded from B1 ratings to B2 ratings due to persistent deficits amid high borrowing costs and, therefore, it affects how much it costs the government to borrow from global financial markets.

Several studies relating to external debt effect on economic growth have been done and the results showing either positive or/and negative effects. Akram (2010), Boboye and Ojo (2012), Onyango (2014), and Ngugi (2016) posted a negative link amid external debt and growth. Nwannebuike and Onuka (2016) and Mukui (2013) confirmed the presence of a positive link. Megersa (2015) and Thieu-Dao and Hoang-Oanh (2017) both verified the presence of the non-linear effect of debt on growth. It is evident that external debt affects growth both negatively and positively over time, thus a non-linear nexus, unlike the linear effect depicted by most studies.

However, despite many studies examining the effects of external debt on economic growth, limited studies have attempted to address the non-linear effect of external debt on an economy. The linear cointegration employed by most studies could not precisely define the form of interaction amid the debt threshold and debt to GDP ratio, this compelled the study. Further, earlier studies did not clearly suggest the debt threshold that results to a negative performance in the economy. Therefore, this study seeks to assess the non-linear effect of external debt on economic growth in Kenya.

LITERATURE REVIEW

Theoretical Literature

A number of theories have been put forward to expand knowledge on the effects of external debt on economic growth. In 1956, a neoclassical economist Robert Solow introduced a neoclassical growth theory. The theory argued that an equilibrium state can be attained by changing the quantities of labor and capital production function and that technological variation play a key role in influencing the economy. According to Solow, technological progress only affects the GDP per capita in the long run through improvement in labor productivity (Odhon'g & Omolo, 2015). Also, additional capital input through human capital and physical capital improves output productivity. Investment in human capital influences economic growth positively through improvement in skills and knowledge gain by the citizenry through further studies. According to neoclassical theory, public debt influences economic growth positively if the sum borrowed is efficiently utilized to expand investment (Onyango, 2014).Conversely, the indirect effect of debt is its consequence on investment through debt servicing and crowding out effect of private investment in the economy. Additionally, foreign debt influences the technology change indirectly through capital accumulation.

Conforming to neoclassical assessment, the crowding effect theory argues that there will be a drop in private investment and consumption as interest rates increases as a result of arise in government expenditure. Stew Myers in 1977 came up with debt overhang concept. Myers argued that debt brings about 'under-investment' problems for the firm that has growth potential

since investors avoid cases where the existence of foreign debt distorts the relevant margins considered for production and investment decisions(Farag & Abed, 2017).According to Megersa (2015) debt overhang explains to a situation where higher and untenable levels of debt by emerging countries lead them to efficiency losses. Georgiev (2014) articulates his assessment that mounting debts have a constructive effect on growth till a definite level then beyond that it develops negative effect for the growth path, he links to a "Laffer curve" hypothesis introduced by Arthur Lafferin 1979.

Empirical Literature

Égert (2012) conducted a test on Reinhart and Rogoff dataset to assess whether the public debt has an adverse nonlinear effect on economic growth if the debt goes beyond the 90 percent threshold of GDP. According to Reinhart and Rogoff (2010), debt to GDP ratio of more than 90 percent has lower economic performance in emerging and advanced economies. Égert (2012) used the non-linear threshold models to show the adverse nexus amid debt and growth. The findings revealed that adverse effects of external debt emerge at lower levels of debt (between 20 percent and 60 percent of GDP).

Mukui (2013) did research on the effect of public external debt on Kenya's economy. A linear model was utilized in assessing Kenya's data for the period between 1980 and 2011. Negative debt-growth nexus was deduced from the results, and further, a negative effect to the economy was contributed by domestic savings, inflation and labor force. A positive effect on the economy was attributed to the foreign direct investment and capital accumulation. Although the study used Kenyan data, it assumed the debt-growth nexus to be linear which according to Megersa (2015) he challenged the linearity.

Mohamed (2013) did an Assessment on the short-run and long-run real effects of public external debt on the economic growth of Tunisia. The research used yearly time series data collected from 1970 to 2010. The Engel and Granger (1987) econometric techniques were utilized in the empirical analysis in order to run a regression using an Error Correction Model (ECM) which allows estimating the short-run and long-run effects of debt. The study found out that the levels of external debt attained by Tunisia government were growth-damaging at the rate of 0.15-0.17 percentage points in the short-run while in the long run at the rate of 0.27 percent as a result of 1 percent increase in external debt. The study estimated a threshold of around 30 percent of GDP.

Megersa (2015) did research on the link between the Laffer curve and the debt-growth nexus in low-income sub-Saharan countries. The study precisely verified the presence of Laffer curve kind of relations, that debt attributes to the growth in the economy till a specific point

(Maximum threshold), then it starts to have an adverse effect on growth thereafter. Megersa (2015) employed a methodology that enables superior tests for bell shapes, and further, the traditional tests based on specifications in the quadratic regressions. The findings from the study depicted confirmation of U-shaped relations amid total public debt and economic growth in the pool of low-income sub-Saharan countries.

Mweni, Njuguna, and Okech (2016) did a time series analysis on the link amid external debt and GDP growth rate in Kenya. The study utilized time series data the period from 1964 to 2012. The link between external debt and GDP growth rate was estimated using OLS. The findings showed an adverse effect of external debt on Kenya's economy despite the regression analysis showing non-statistically significant relations.

Nwannebuike, Ike and Onuka (2016) did an assessment on the impact caused by external debt on Nigeria's economy. Their study employed an Ex-post facto research design to analysed data for the period between 1980 and 2013. The results showed that, in the short run, there is a positive relation amid GDP and external debt stock, and also with the exchange rate while external debt service payments reveal an adverse relation to GDP. The study contributed positively to the literature by proving a positive impact caused by exchange rate fluctuations and external debt stock to Nigeria's economy.

Thieu-Dao and Hoang-Oanh (2017) conducted research in Vietnam on the Non-Linear relations amid economic growth and external debt. The study aimed at establishing the debt-growth relationship for the period between 2000q1 and 2012q4. The study calculated the threshold of external debt along with debt-growth relations in Vietnam using OLS (Ordinary Least Squares) method linked with the Error Correlation Model (ECM) of Johansen-Juselius. The results proved the presence of non-linear (Bell-shaped) relations amid growth and public external debt having a threshold level of 28%. Further, the study calculated the effect of additional external debt to economic growth suppose government borrowing exceeds the threshold. However, the study used a trial and error method in finding out the peak point thus rendering the results not so accurate and unreliable.

Summary of the Literature

It can be noted that different techniques applied by most studies gave different findings and conclusion. Mukui (2013) established a positive relationship between external debt and economic growth by considering linear model while, Mweni et al., (2016) and Mohamed (2013) established an adverse effect of external debt. Megersa (2015) and Thieu-Dao and Hoang-Oanh (2017) should the possibility of having both positive and negative effects of external debt on the economy by considering the non-linear model. However, despite limited studies adopting

the non-linear model, none of the studies utilized the Kenyan data to establish the non-linear effect of external debt on Kenya's economy.

METHODOLOGY

The study espoused a descriptive research design to establish the 'what is' or 'what was' the causal effect of external debt on economic growth. The study used time series data for the period 1970 to 2017 in Kenya for the following variables; real GDP growth rate, external debt, real interest rate, trade, government balance, investment, and population growth rate. The rationale for choosing the period for the study was informed by the major economic reforms and liberalization that had occurred during the period, as well as widening the scope to allow for effective and reliable analysis.

The empirical model was derived from the augmented Solow growth model based on conditional convergence, specified as follows:

$$Y_t = \alpha_t + \beta X_t + \gamma_1 D_t + \gamma_2 D_t^2 + \varepsilon_t \qquad (3.1)$$

Where, Y_t the real GDP growth rate, D_t, and D_t^2 are external debt and external debt square respectively $\alpha_t, \beta, \gamma_1, and \gamma_2$ are the coefficient parameters. The model supports debt-growth Laffer curve nexus if the γ_1 coefficient of debt is positive and the γ_2 coefficient of debt squared is negative. The turning point of the quadratic function ascertains the level of debt at which the marginal impact of debt results to an adverse effect on growth. The debt threshold was calculated using the $\gamma_1 \, and \, \gamma_2$ coefficients. To estimate the objective of the study equation 3.1 was extended to establish the non-linear effect on growth as a result of growing external debt in the country, as follows:

$$Y_t = \propto + \beta RGDPR_{t-1} + \beta_2 ED_t + \beta_3 ED_{sq\,t} + \beta_4 Popg_t + \beta_5 RI_t + \beta_6 GFCF_t + \beta_7 GOVBAL + \beta_8 TR + \mu_t$$

(3.2)

Where, β_0 is a constant, $\beta's$ are the proxy for independent variables while ε_{11} is the error term. $RGDPR_{t-1}$ First lag of real GDP growth rate, *ED* is the external debt, $ED_{sq\,t}$ is the external debt square, *Popg$_t$* is the population growth rate, RI_t is the real interest rate, $GFCF_t$ is the gross fixed capital formation (investment proxy), $GOVBAL$ is the government balance and TR is the Trade.

Data collection procedure and Analysis

To realize the objective, annual time series data for the period 1970 to 2017 was collected and time series tests were conducted. This study used secondary data from the statistical abstracts, World Bank reports, the National Treasury of Kenya reports and the Kenya National Bureau of

Statistics annual economic Surveys. The quantitative data were summarized and analyzed using Eviews by estimating the coefficients of the equation using the Generalized Method of Moments (GMM).

ANALYSIS AND RESULTS

Descriptive Statistics

The statistics showed that GDP growth rate for the period 1970 to 2017 stood at an average of 4.13 percent with a standard deviation of 2.0922 and a median of 4.7 implying that data was symmetrical. Smaller standard deviation implies that more data is clustered around the mean, therefore implying that economic growth in Kenya has been revolving around 4.13 percent. Additionally, the mean and median enabled the study to check the presence of outliers in the data set. The Skewness of -0.312 showed that the data was moderately skewed (range of -1 and -0.5) to the left with a long tail on the negative side.

Unit Root Tests

The unit root tests results in *Appendix 1* showed that real GDP growth rate was significant at all levels (1%, 5%, and 10%) with constant, both when tested using ADF and PP tests. However, when the trend was introduced real GDP growth rate became only significant at 5% and 10% significance level, implying that real GDP growth rate was stationary and integrated of order I (0). Unit root tests results for External debt showed that data become significant at first difference both when tested with the trend and without and also using both ADF and PP tests implying that External debt was Stationary and integrated of order I (1).

Gross Fixed Capital Formulation (GFCF) for public sector unit root tests results showed that it was significant at 5% and 10% at constant with the trend and without for ADF tests but significant at all levels with the trend and constant when tested using PP tests. This implies that GFCF was stationary and integrated of order I (0). Openness to Trade results showed it is significant at all levels with constant and trend and without for both ADF and PP tests after first differences, implying that trade is stationary and integrated of order I (1). Real interest rate was significant at all levels with constant and with the trend for both ADF and PP tests in, implying that it is stationary and integrated of order I (0).

Empirical Results

Non-linear Effect of External Debt on Economic Growth in Kenya

According to Megersa (2015), a model is considered non-linear if the coefficient of the independent variable is positive and the coefficient of the squared value of the same

independent variable is negative or vice versa. The findings obtained from estimating *equation 3.1* showed that the model is non-linear by estimating the coefficient of external debt as -0.168210 and coefficient debt squared of 0.137786. The study predicted the debt threshold at 61.04 percent by using the regression coefficients estimated above. The study adopted the Sedgwick (2013) formulae of calculating the turning point, that is, (the coefficient of the linear term divided by two times the coefficient of the squared term). This means that when the debt to GDP ratio exceeds 61.04 percent there will be an adverse effect of external debt on economic growth in Kenya.

Table 3: Regression Output for Equation 3.2

Dependent Variable: Real GDP Growth Rate

Independent Variable		Coefficient	t-Statistic	Prob.
First Lag of Real GDP Growth Rate		0.291547	1.606233	0.1067
External debt (First difference)		-0.666951	-3.638327	0.0008
External debt square (First difference)		0.013116	2.186935	0.0351
Real Interest rate		-0.056222	-1.363076	0.1818
Gross Fixed Capital Formulation (GFCF)		0.397746	2.982566	0.0050
Trade		0.093288	0.991285	0.3288
Government Balance		0.048085	1.521088	0.1367
Population Growth Rate		2.881771	1.646064	0.1082
R-squared	0.605086	F-statistic		7.778598
Adjusted R-squared	0.529566	Prob (F-statistic)		0.005287
Durbin-Watson Stat	2.008060			

The findings showed the external debt coefficient as a negative coefficient of -0.666951 and the external debt square coefficient as a positive coefficient of 0.013116. This actually conforms to Megersa (2015) findings which argued that a model is considered non-linear if the γ_1 coefficient of debt is negative and the γ_2 coefficient of debt squared is positive or vice versa. This means that a unit change in external debt when still within its manageable level influences positively the economic growth of Kenya by about 66.70 percent, however, beyond the debt threshold, a unit change in external debt results to an adverse effect on economic growth. This implies that the association between external debt and economic growth in Kenya is non-linear and support the debt-growth Laffer curve nexus.

The results for other independent variables showed a positive association with economic growth. Gross fixed capital formation (GFCF) which is an indicator of investment showed a

positive coefficient of 0.397746, implying that a unit change in investment results to 39.77 percent improvement in economic growth. Government balance and population growth rate showed insignificant coefficients of 0.0481 and 2.88. The real interest rate was included in the model to take care of the effects that could have been as a result of inflation over the period of time, the model showed a negative relation with economic growth with a coefficient of -0.05622. This implies that unit change inflation affects the economy of Kenya negatively by 5.62% through payment of interest charges on external debt. The trade variable was included in the model to capture the effect of openness to trade on Kenya's economy as a way of expanding the model beyond the horizon of a closed economy as well as addressing the effect of an exchange rate. The findings showed a positive coefficient of 0.093288 which was insignificant; this could be attributed to low volumes of exports relative to imports in Kenya.

The variations in the independent variables of the model jointly accounted for 60.51 percent of the variations in economic growth; however, when adjusted for degrees of freedom, the model accounted for 52.96 percent of the variations which implies that the model has a good fit and can explain the vicissitudes in Kenya's economy.

CONCLUSIONS

The objective of the study was to establish the non-linear effect of external debt on economic growth in Kenya. The motive of this study was driven by the fact that external debt has consistently risen overtime and on the hand economic growth seemed to be stagnant overtime. This study aimed to establish that external debt has both positive and negative effects that work interactively at a certain debt threshold. The study found out that a unit change in external debt when still within its manageable level influences positively the economic growth of Kenya by about 66.70 percent, however, beyond the debt threshold, a unit change in external debt results to an adverse effect on economic growth. The study calculated the debt threshold to be at 61.04 percent. In general, the study concludes that external debt not only has negative effects but also positive effects on the economy. This implies external debt at different levels have two conflicting effects that work interactively and therefore the government should consider regulating the levels of external debt within a certain threshold.

POLICY IMPLICATIONS AND AREAS FOR FURTHER RESEARCH

The government should adopt some fiscal policy to curb excessive accumulation of external debt, the budget deficit (government balance), and trade deficit and encourage investment by attracting funds like Foreign Direct Investment (FDI) and overseas remittances to maintain a sustainable level of external debt. The government should also diversify sources of funding by

identifying non-debt sources of funding .In line with the escalating external debt in Kenya, it would be essential to further conduct research on the ability of the country to repay back its debts once the country has exceeded the debt threshold. This would enable the country to avoid being categorized as bankrupt due to its inability to repay its loans as well as improving the country's credit ratings.

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APPENDICES

Appendix 1: Unit root test results

Variables		Unit Root Test			
		ADF Tests		PP Tests	
	Levels	t-statistics	Critical values (5%)	t-statistics	Critical values (5%)
Real GDP Growth rate	Constant	-3.882320	-2.92516	-3.724441	-2.92516
	Constant and Trend	-3.789775*	-3.50850	-3.55760*	-3.50850
External Debt (% of GDP)	Constant	-5.142144 (-1)	-2.92662	-5.261150 (-1)	-2.92662
	Constant and Trend	-5.848579 (-1)	-3.51074	-5.890284 (-1)	-3.51074
GFCF public	Constant	-3.501291*	-2.92516	-3.40142*	-2.92516
	Constant and Trend	-3.528193*	-3.50850	-20.13095 (-1)	-3.51074
Population growth rate	Constant	-6.439798 (-1)	-2.92973	-6.484353 (-1)	-2.92973
	Constant and Trend	-6.531694 (-1)	-3.51552	-6.544029 (-1)	-3.51552
Real Interest	Constant	-3.854151	-2.92814	-4.016727	-2.92814
	Constant and Trend	-4.380572	-3.51307	-4.592873	-3.51307
Trade (% of GDP)	Constant	-7.911108 (-1)	-2.92662	-8.746330 (-1)	-2.92662
	Constant and Trend	-7.862878 (-1)	-3.51074	-8.757260 (-1)	-3.51074

(-1) implies that the variable became stationary after first difference and * denotes that the variable is not statistically significant at 1% but significant at 5% and 10% level of confidence

Source: Author