

## THE EFFECT OF PUBLIC DEBT ON ECONOMIC GROWTH IN KENYA

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### ABSTRACT

*The study investigates the effect of public debt on economic growth in Kenya, between 1980-2013. The choices of period was guided by data availability and escalation of Kenya's public debt. The main problem is that, Kenya government has been relying heavily on public debt, aid and grants as a source of finance. This has resulted to a buildup of the level of public debt stock which has led to funds being diverted to debt servicing at the expense of economic development and domestic consumption. The specific objectives for the research were to assess the effect of external debt on economic growth in Kenya, to determine the effect of domestic debt on economic growth in Kenya and to find out the effect of other macro economic factors on economic growth in Kenya. Times series regression model has been used to determine the effect of public debt on economic growth in Kenya and data was analyzed using E-views 8. Various tests were carried out to test for stationarity, normality, autocorrelation, heteroscedasticity using the same software package. The data series used were stationary at integrated order level zero as given in the KPSS results. The coefficient of determination (R<sup>2</sup>) indicated that about 82% of change in GDP was accounted for by the explanatory variables while the adjusted R-square of 73% further justified this effect. Public debt servicing, domestic debt, real interest rate, inflation and a lagged PIGR affected the growth of the GDP negatively while external debt, real exchange rate, lagged GDP and private investment affected growth of the GDP positively. This study recommends that public borrowing (government) from international markets and domestic debts should be contained since it has led to high cost of borrowing and crowding out of the private sector.*

**Keywords:** Crowding out effect, Debt Overhang effect, Domestic debt, External debt and Total debt servicing.

### INTRODUCTION

### 1.1 Background of the study

Kenya as a Country has not attained a continuous economic growth duration for a long period of time. The Kenyan growth rate has been fluctuating from 1960s with more economic growth rates being noticed in 1960s and beginning 1970 before economic performance started declining in the mid-1970. Between 1974 and 1993, real GDP started reducing since the bilateral and multilateral aid was cut due to mismanagement of resources and shrinking of agricultural production (Osewe, 2013).

Social indicators worsened markedly between 1980s and 2002. For instance, according to Kenya Demographic and Health Survey, 2003, infant death rate increased from 96 per thousand births to 114 per thousand births in the same period and life expectancy declined from 57 years in 1986 to 47 years in 2000. In 1993, the Government of Kenya began a major program of economic reform and liberalization. A new minister of finance and a new governor of the central bank undertook a series of economic measures with the assistance of the World Bank and the International Monetary Fund (IMF). As part of this program, the government eliminated price controls and import licensing, removed foreign exchange controls, privatized a range of publicly owned companies, reduced the number of civil servants, and introduced conservative fiscal and monetary policies. From 1994 to 1996, Kenya's real GDP growth rate averaged just over 4% a year (ROK, 2013).

In 1997, however, the economy entered a period of slowing or stagnant growth, due in part to adverse weather conditions and reduced economic activity prior to general elections in December 1997. In July 1997, the Government of Kenya refused to meet commitments made earlier to the IMF on governance reforms. As a result, the IMF suspended lending for three years, and the World Bank also put a \$90 million structural adjustment credit on hold (IMF, 2013).

The Government of Kenya took positive steps on reform, including the 1997 establishment of the Kenya Anti-Corruption Authority, and measures to improve the transparency of government procurements and reduce the government payroll. In July 2000, the IMF signed a \$150 million Poverty Reduction and Growth Facility, and the World Bank followed suit shortly after with a \$157 million Economic and Public Sector Reform credit. In 2006 Kenya's gross domestic product (GDP) was about US\$17.39 billion. The country's real GDP growth picked up to 2.3 percent in early 2004 and to nearly 6 percent in 2005 and 2006, compared with a sluggish 1.4 percent in 2003. Over the decade from 2003-2013, Kenya's economy grew steadily from 2.9% in 2003 to 7% in 2007 due to conducive environment caused by political stability and implementation recovery strategy. However in 2008, political instability reversed the gains made and the economy dipped to 1.5%. In the following years modest growth was noted from 2009-2010 but it dipped again in 2011 due to ripple effects of the global recession. On average, the economy grew by 5% over the period 2003-2013 which is much lowered as compared to Uganda's growth of 7%, Tanzania's growth of 7%, Rwanda's growth of 7.1% and EAC average of 5.9% over the same period. On the other hand the public debt rose highly over the past periods and this trend was accompanied by an expansion in the size of governments (ROK, 2013).

#### 1.1.1 Global Perspective of Public Debt on Economic Growth

The impact of domestic public debt on economic growth of many nations remains a controversial issue in both academic and policy making forum (Akram, 2010). Empirical and theoretical studies try to analyze the question of whether the rising of public debt shows positive or negative effects on the growth rate of an economy.

Most broad rationalization of the adverse effect of debt is “debt overhang” effect. If there is some likelihood that in future, debt will be larger than the country’s repayment ability then anticipated debt-service costs will depress further domestic and foreign investment (Karagol, 2002). The other channel through which debt obligations affect economic growth is known as “crowding out” effect. If a greater portion of foreign capital is used to service external debt, very little will be available for investment and growth. Debt-servicing cost of public debt can crowd out public investment expenditure, by reducing total investment directly and complementary private expenditures indirectly (Karagol, 2002).

According to Abbas (2007), the higher interest rates increase the cost of financing new private investment "crowding – out " and hence limit economic growth. The higher interest rate may also have an adverse effect on the trade balance which is an important parameter of economic growth. Since the government assets become more attractive to foreign investors, so the demand for local currency will increase which tends to push up the price of domestic currency in terms of other currencies, the imports will rise and the exports tend to decline (it become more expensive), hence large trade deficit will ensue which ultimately hinder the economic growth. However, various authors (Pattillo, Poirson & Ricci, 2004) are unable to find evidence of a significant crowding out effect; while others (i.e. Chowdhury, 2004, Clements, Bhattacharya & Nguyen., 2003,) find that both debt burden and debt service obligations have reduced the investment and economic performance. (Ochieng, 2013).

COUNTRIES ▼	Government Debt to GDP	Reference	Previous	Highest	Lowest	Unit	
Australia	20.48	Dec/13	27.16	31.70	9.70	Percent	[+]
Brazil	56.80	Dec/13	58.80	60.90	53.40	Percent	[+]
Canada	89.10	Dec/13	88.10	101.70	66.50	Percent	[+]
China	22.40	Dec/13	26.00	33.50	1.00	Percent	[+]
Euro Area	92.60	Dec/13	90.70	92.60	66.20	Percent	[+]
France	91.80	Dec/13	90.60	91.80	20.70	Percent	[+]
Germany	78.40	Dec/13	81.00	82.50	55.60	Percent	[+]
India	67.72	Dec/13	66.60	84.30	66.60	Percent	[+]
Indonesia	26.11	Dec/13	24.03	95.10	24.03	Percent	[+]
Italy	132.60	Dec/13	127.00	132.60	90.50	Percent	[+]
Japan	227.20	Dec/13	218.80	227.20	50.60	Percent	[+]
Mexico	36.90	Dec/13	33.10	37.20	17.10	Percent	[+]
Netherlands	73.50	Dec/13	71.30	76.10	45.30	Percent	[+]
Russia	13.41	Dec/13	12.74	99.00	7.90	Percent	[+]
South Korea	33.80	Dec/13	34.80	34.80	7.99	Percent	[+]
Spain	93.90	Dec/13	86.00	93.90	16.60	Percent	[+]
Switzerland	35.40	Dec/13	36.40	54.60	25.10	Percent	[+]
Turkey	35.85	Dec/13	36.18	77.90	35.85	Percent	[+]
United Kingdom	90.60	Dec/13	89.10	90.60	31.30	Percent	[+]
United States	101.53	Dec/13	100.10	121.70	31.70	Percent	[+]

**Figure 1. 1: Global Public Debt to Economic Growth**

Source: (Trading Economics – Global, 2013)

### 1.1.2 Public Debt Level and Economic Growth in Kenya

The Internal Loans Act (Cap 420) provides the legal framework for the cabinet secretary to National Treasury to borrow on behalf of the government from the domestic market through issuance of Treasury bills and Treasury bonds. The government overdraft at the Central Bank of Kenya is the only aspect of domestic debt borrowing that seems to be limited by law. Domestic borrowing through Treasury bills and bonds do not seem to have a limit in law. This is different from external borrowing where the External Loans and Credit Act, CAP. 422 of the laws of Kenya limits the total indebtedness in respect of principal amount to Kshs 500 billion or such higher sum as the National Assembly may by resolution approve (Ochieng, 2013).

The evidence of highly increasing level of debt producing a negative impact on economic development was noted in the first United Nations Development Decade Even though the developing nations attained the minimum target of annual growth of GDP of 5 percent easily by 1970s, nearly about half of official foreign exchange receipts were used for the purpose of repaying debt to official lenders. The reduction in official government cash flows during the period made debt servicing very difficult thereby necessitating debt rescheduling for the governments. The continuous reduction in official assistance and increasing level of multilateral assistance in the poorer and developing nations especially in the sub-Sahara Africa together with a rapid increase in the private sector liquidity because of expansion of the Eurodollar market during the beginning of 1970s resulted into an increase in private sector borrowing by a number of rapidly developing countries (Osewe, 2013).

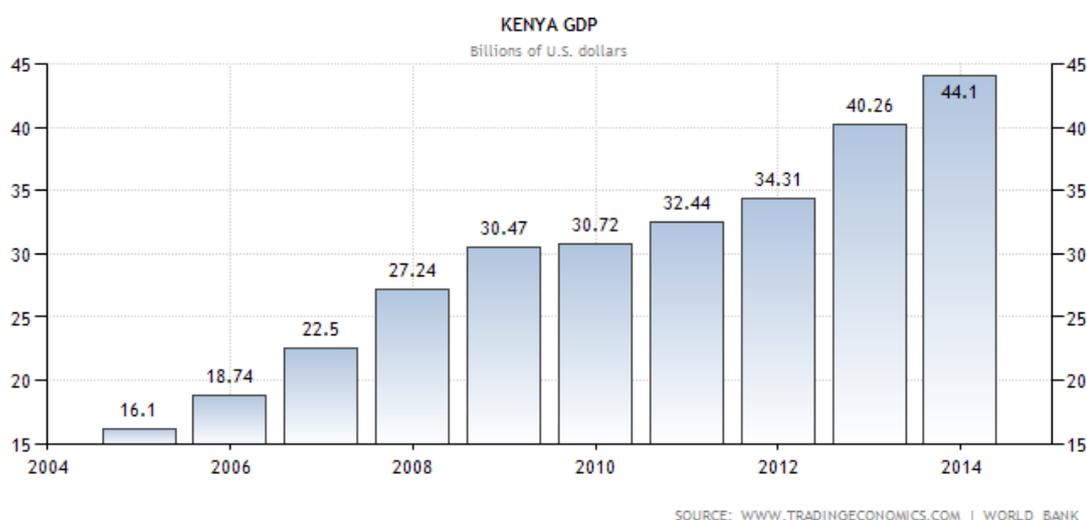
The 1990s witnessed a steady decline in development assistance to Kenya occasioned by a perception of poor governance and mismanagement of public resources and development assistance. Other factors include the end of the cold war and the collapse of the Soviet Union. This led to a debt crisis in the country in the early 1990s which turned Kenya into a highly indebted nation. The debt problem was exacerbated by macroeconomic mismanagement in the 1990s such as the Goldenberg scandal which fleeced Kenyans billions of shillings leading to a reduction of donor inflows. The government thus resorted to occasional debt rescheduling and expensive short-term domestic borrowing to finance its expenditures (Putunoi & Mutuku, 2013). Public borrowing is inevitable and not reprehensible phenomenon of economic growth. It is a way to stimulate economic growth by injecting money from foreign investors (external debt) into it as well as distributing assets (internal debt) among those who has more than they can use at the moment and those who lack assets for developing economic initiative or other needs (Osewe, 2013).

However the persistent increase in the stock of public debt has negatively impacted on private investment levels in Kenya. It has reduced the current and future investment through increases in the cost of capital (borrowing by the private sector). It has also affected the current flow of resources available in the economy when domestic debt is used to service external debt (Karazijene & Saboniene, 2009). Public debt has distorted the economy and complicated macroeconomic management causing poor social and economic status for Kenyan citizens. The debt problem has been exacerbated by increasing fiscal and balance of payment deficits; slow export growth, over reliance on primary export; overvalued exchange rates and negative real interest rate have also contributed to a rise in public debt which is estimated to be 53% of GDP (RoK, 2007).

Kenya's debt level has been increasing over the last ten years. For instance, the nation's external debt level increased from Kshs. 466,294 Million to Kshs.789, 076 Million representing 67.8 percent and 50.5 percent of GDP for June 1996 and June 2006 respectively

(Njuguna, Kamau & Owino, 2008). The highest debt ratio was experienced in 1993 while lowest ratio was in 2008 which recorded 131.9% and 25% respectively. The GDP growth rates plunged into low level of 0.6% and 1.5% in 1993 and 2008 respectively. On the contrary, despite low performance in GDP growth rate, debt service remained relatively high all through. Debt service remained above 5% between 1980s and 1999. However, beginning 2000 debt service began to decline while GDP growth rate rose from as low as 0.6% in 2000 to reach 7% in 2007. Total external debt service on Central Government debt increased from Kshs. 23,611 million in June 2010 to Kshs. 28,055 million in June 2011 (CBK, 2012).

Kenya's net domestic debt stood at 20 percent of GDP (Kshs 708 billion) at the end of 2012 (CBK, 2013). As per the treasury's Quarterly Economic and Budgetary Review report (2013), the rate of increase in domestic borrowing outpaced external borrowing. Commercial banks remained the biggest lenders to government with funds worth Kshs527 billion by June 2013 of more than 7% increase. Gross public debt increased from Kshs. 1.633 trillion as at end of June 2012 to Kshs. 1.894 trillion by June, 2013, comprising of 44.5 per cent external and 55.5 per cent domestic. Net public debt increased by Kshs. 249.6 billion over the same period. The overall increase was attributed to net increase in both domestic and external borrowing (CBK, 2013).



## LITERATURE REVIEW

### 2.1 Introduction

This chapter reviewed both theoretical and empirical literature on the effect of public debt on economic growth and investment in Kenya and developed a conceptual framework. The chapter also provided a critical review and expounded on the research gaps. Lastly, the study presented a summary of the literature review.

### 2.2 Theoretical Review

There are three theories which support the research objectives which discuss the effect of public debt on the economic growth in Kenya.

#### 2.2.1 Theories on debt burden

##### 2.2.1.1 *Debt Overhang Hypothesis*

The theory holds that both the stock of public debt and its service affect growth by discouraging private investment or altering the composition of public spending. Higher external interest payments can increase a country's budget deficit, thereby reducing public savings if private savings do not increase to offset the difference. This in turn, may either drive up interest rates or crowd out the credit available for private investment, depressing the economic growth. Debt service may discourage growth by squeezing the public resources available for investment in infrastructure and human capital (Clements et al., 2005).

The theory further suggests that public debt may have non-linear effects on growth, either through capital accumulation or productivity growth. According to the debt overhang hypothesis thesis there is likelihood that in the future debt will be larger than the country's repayment ability; expected debt service costs will discourage further domestic and foreign investment. Potential investors will fear that the more there is production, the more they will be taxed by creditors to service the public debt and thus they will be less willing to incur investment costs today for the sake of increased output in the future (Krugman, 1988). The above theory instigates the first research hypothesis and total debt service variable that increased borrowing may cause debt overhang effect causing the government unable to pay debt when it falls due.

##### 2.2.1.2 *The Crowding out effect neo-classicalists theory*

It considers individuals to be planning their consumption decision over the entire life cycle. By shifting tax burden to the future generations, borrowing increases present consumption. This school of thought assumes full employment implying that increase in consumption decreases savings, causing interest rates to increase in the capital markets to restore the equilibrium. The higher interest rates in turn results in a decline in private investment, higher inflation and increased real exchange rate. This crowding out effect impedes the effectiveness of the government to influence the economy through fiscal policies (Bailey, 1971; Buiter, 1977). The theory supports the second and third objective

#### 2.2.2 Growth Theories

### 2.2.2.1 Endogenous Growth Models

Models hold that fiscal policy has significant effects on long run economic growth and investment. Other things held constant, a larger budget deficit crowds out private sector because of lower access to bank credit, higher real rates of interest, inflation and a more appreciated real exchange rate (Barro, 1989 and 1990).

## 2.3 Theoretical Model

### 2.3.1 Endogenous growth Model

It also guided in the development of empirical model. It provides a linkage between public policies and long run growth by assuming aggregate production functions exhibiting non decreasing returns to scale (Renelt, 1991). It states that economic growth and investment primarily depends on endogenous or within factors and not on external factors.

Here investment in human capital and labour are significant contributors to economic growth. Long run economic growth rate of a country is assumed to depend on government policy measures. This study borrowed the initial model from Akram (2010) which assumes a Cobb-Douglas production function with non- decreasing returns to scale.

Cunningham (1993) introduced debt burden into the production function as per (Akram, 2010). This is because debt burden has important implications for the capital and labour productivity. Nations that carries a significant debt burden requires spending portion of its resources to service its debt liabilities having significant implications on decisions regarding the employment of labour and capital in the production function. Therefore, a debt-inclusive production function can be written in the following form.

$$Y=A(K, L, Debt) \dots \dots \dots (3.1)$$

Where Y, K, L, debt and A are the measure of GDP, capital stock, labour force, public debt and other constant factors respectively. This makes standard assumption in equation that input elasticity's of output are constant and technical change is neutral.

Keeping in view the importance of investment according to the Presbitero (2005), it is better to disentangle the analysis of public debt and economic growth in a two-step relationship, firstly the direct links between public debt and economic growth are explored then relationship between public debt and Investment is also analyzed.

The growth equation in the reduced vector form can be written as under:

$$y_t = \alpha + \sum_{j=1}^k \delta x_{tj} + \sum_{m=1}^p \pi Debt_{tm} + \varepsilon_t \dots \dots \dots (3.2)$$

Where  $Y_t$  is annual GDP at t time and  $x_{tj}$  is a vector of control variables,  $x_{tm}$  is the vector of various public debt indicators, and  $\varepsilon_t$  is the classical error term.

This model can be further extended to capture the effects of debt on investment, as it is the basic channel through which debt affects economic growth.

$$Inv_t = \alpha + \sum_{j=1}^k \delta x_{tj} + \sum_{m=1}^p \pi Debt_{tm} + \varepsilon_t \dots \dots \dots (3.3)$$

Where  $inv_t$  is investment at t time and  $x_{tj}$  is a vector of control variables,  $x_{tm}$  is the vector of various public debt indicators, and  $\varepsilon_t$  is the classical error term.

To empirically test the effect of public debt on economic growth, time series data of Kenya for the period of 1980-2013 was used.

## 2.4 Empirical Literature Review

Osewe (2013) analyzed the effect of external debt and inflation on economic growth in Kenya using the Solow's growth model and concluded that there was no long term causality relationship between the variables.

Ochieng (2013) looked at the relationship between public debt and economic growth using the Harrod Domar Growth model and concluded that domestic debt in Kenya was reasonably sustainable. The study analyzed the impact of external and domestic debt using the Harrod Domar Growth model whereas the current study is using the Endogenous growth model.

Njuru (2012) highlighted the effect of fiscal policy on private investment in Kenya using the VAR model and the results showed that fiscal policy design and implementation matters to private investment levels. The research focused on fiscal policy on private investment. Qureshi & Ali (2010) analyzed the impact of high public debt burden on the economy of Pakistan. The sample of the study was 1981 to 2008. From their study a vast negative impact of public debt on the economy of Pakistan had been found by the authors. The study was based in Pakistan. The current study has borrowed heavily from the above study.

Sheikh, Faridi & Tariq (2010) studied the impacts of domestic debt on economic growth and also observed the impact of domestic debt servicing on economic growth in Pakistan by applying the OLS technique for the period of 1972 to 2009. The study indicated that the negative impact of domestic debt servicing on economic growth is stronger than positive impact of domestic debt on economic growth. The researcher compared the findings of the current study with the findings of the above study.

Checherita & Rother (2010) determined the average impact of government debt on per capita GDP growth for twelve euro area countries over a period of about 40 years from 1970- 2009. The study showed non-linear negative impact of government debt on economic growth. It enhanced the current study by comparing the findings.

Kumar & Woo (2010) studied the impact of high public debt on long-run economic growth for a panel of advanced and emerging economies over 1970-2007. Their empirical results suggest an inverse relationship between initial debt and subsequent growth: on average, a 10 percentage point increase in the initial debt-to-GDP ratio is associated with a slowdown in annual real per capita GDP growth of around 0.2 percentage points per year, with the impact being somewhat smaller in advanced economies. The study looked at Euro countries and it was a basis to look at an example in African developing countries to show the impact the public debt has on their economic growth. The variables were population, investment and government size. In the current study more parameters of public debt were added

Akram (2010) examined the impact of public debt on economic growth in Pakistan for the period 1970-2009 using the Solow's growth model and found that public debt almost always results in deteriorating economic growth process as it affects investment. The current study borrowed heavily from this research including the model used since it was similar.

In another study, Abbas & Christensen (2010) analyzed optimal domestic debt levels in low income countries (including 40 sub-Saharan Africa countries) and emerging markets between 1975 and 2004 and found that moderate levels of marketable domestic debt as a percentage of GDP have significant positive effects on economic growth. The study provided evidence that debt levels exceeding 35% of total bank deposits have negative impact on economic growth.

Achieng (2010) analyzed the effect of domestic debt on private investment using the Johansen Co integration approach and found that the variables were significant at 5%. The research focused on domestic debt variable on private investment.

Kibui (2009) studied the impact of external debt on public investment and economic growth in Kenya (1970-2007). The study used time series data for the period 1970-2007 and reduced form growth model augmented with debt variables to examine the impact of external debt on public investments and economic growth in Kenya. The findings of the study indicate that the key debt indicators have been above the critical level since 1982. The Empirical results of the time series data analysis for the period 1970-2007 indicate that debt service ratio is significant at explaining the GDP growth in Kenya. Public investment has a negative relationship with both the stock of external debt expressed as a percentage of GDP and debt service ratios.

The results indicate that debt relief could act as a catalyst for investment recovery and economic growth in Kenya. The Kenyan government should also embark on an aggressive poverty reduction drive, focus on growth enhancing policies that will lead to increased export earnings, provide a stable environment for investments and implement measures that will increase investor confidence in local investments. The study concentrated on external debt on public investment and economic growth and ignored the domestic debt.

Makau (2008) did an empirical analysis on the external public debt servicing and economic growth in Kenya. The study used a single growth equation model estimated using Ordinary least Square (OLS) method with annual time series data covering the period 1970 - 2003. The findings of the study indicated that Kenya's external debt is mainly official, of which a bigger proportion is from multilateral sources. External debt accumulation has been rising over the years with debt burden indicators increasing steadily in the early 1990s. A "specification associated with error correction modeling (ECM) was applied. By using Co integration and error correction model, the study established both the short run and long run equilibrium.

The estimated model was a single regression equation with the growth rate of Gross Domestic Product as the dependent variable and explanatory variables were savings as-a ratio of GDP, stock of external debt as a ratio of GDP, debt service as a ratio of GDP, interest payment as a ratio of GDP and the annual growth rate of labour force. The empirical results in the short run estimated model indicated that the coefficients of external debt to GDP, savings to GDP and debt service to GDP had the correct sign and significant while the coefficients of interest to GDP and growth in labour force were insignificant.

In the long run estimated model, the coefficients of debt to GDP, debt service to GDP and savings to GDP were significant while the coefficient for growth in labour force and interest to GDP were insignificant. The study concentrated on public debt servicing on economic growth in Kenya.

Maana, Owino & Mutai (2008) analyzed the impact of domestic debt on Kenya's economy using the ordinary least square method and modified Barro growth regression model. The findings indicated that although the relationship between the domestic debt and economic growth is positive, it is insignificant. The study did not incorporate the foreign debt variable.

Cholifihani (2008) analyzed long term and short term relationships between public debt service and GDP in Indonesia by applying co integration analysis of time series model from 1980 - 2005. These relationships used an extended production function model that measured GDP as a function of debt service, capital stock, labor and human capital. The result show that Indonesia faces a debt overhang problem in the long run since increasing the public

external debt service slows economic growth. The study was done in Indonesia and a Kenyan perspective is required to be analyzed.

Christensen (2005) used a cross country survey of the role of domestic debt markets in sub-Saharan Africa based on a new data set of 27 sub-Saharan African countries during the 20 year period (1980-2000) and found out that domestic markets in these countries are generally small, highly short term and often have a narrower investor base. He also found out that domestic interest rate payments present a significant burden to the budget with significant crowding-out effects. Both studies were done for Sub Saharan Countries and a Kenyan perspective will give more insight.

M'Amanja & Morrissey (2003) looked at the fiscal policy and economic growth in Kenya using the multivariate co integration and vector error correct model. The results found that the external debt has a significant negative impact on long run growth and public investment and Imports have strong beneficial effects on per capital income in Kenya. The study concentrated on the impact of Government national expenditure on economic growth in Kenya.

The study was done on a developed country on the impact of Government national expenditure. The study will use this study to compare the impact of Government national expenditure of the developing county against that of developed county. The variables used in this study were consumption, investment and transfers which differed from the researcher's.

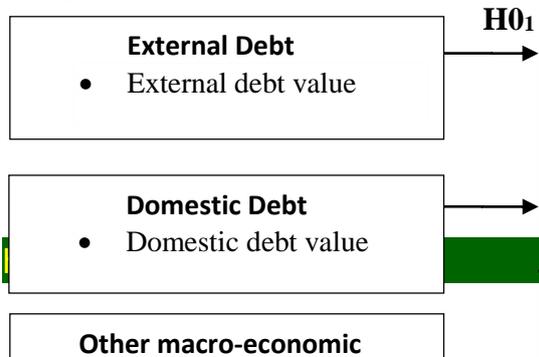
## 2.5 Research Gap and Summary of Literature Review

Finance theory presents various schools of thought having different paradigms on the effect of public debt on the economic growth. The model argues that by shifting the tax burden to the future generations, current borrowing crowds out private investment. Several empirical studies such as Qureshi & Ali (2010); sheikh et al (2010); Checherita & Rother (2010); Akram (2010); Abbas & Christensen (2010); Osewe (2013); Ochieng (2013); Njuru (2012); Achieng (2010); Kibui (2009); Makau (2008); Maana et al (2008) and M'Amanja & Morrissey (2003) have shown mixed results on the impact of public debt on economic growth. Some studies are of the view that external and domestic debt impedes the economic growth but some are in the opinion that they positively affect the economic growth. The current study, unlike most of the studies that have dwelt on the causality relationship between public debt and economic growth, deviates from previous studies by taking into account the effects of public debt on economic growth.

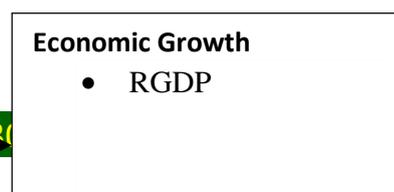
## 2.6 Conceptual Framework

The conceptual framework of this study spells out the relationship between the external debt to GDP, domestic debt to GDP, real exchange rate as a percentage to GDP, Real interest rate to GDP, Inflation to GDP, and Private investment to Gross National income in percentage and Total debt service to GDP (independent variables), Real GDP -economic growth in Kenya (dependent variable). The study therefore seeks to determine the effect of independent variables on the dependent variable.

### Independent Variables



### Dependent Variable



**H0<sub>2</sub>**

**H0<sub>3</sub>**

**Figure 2.3: Conceptual Framework**

**Source: (Author, 2016)**

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter set out the methodology adapted and used in this study. It included the following subsections; research design, Research philosophy, data collection instrument, model specification and data analysis techniques that were used.

#### 3.2 Research Design

Causal research, also called explanatory research is the investigation of (research into) cause-and-effect relationships. In order to determine causality, it is important to observe variation in the variable that is assumed to cause the change in the other variable(s), and then measure the changes in the other variable(s). Other confounding influences need to be controlled for so they don't distort the results, either by holding them constant in the experimental creation of data, or by using statistical methods. The design is appropriate in this study since shows the effect of public debt on economic growth in Kenya.

##### 3.2.1 Research Philosophy

Positivism is based on believe on stable reality which can be described from an objective perspective (Saunders & Lewis, 2000). In this case, the phenomena being studied is not interfered with. Positivism involves manipulation of reality with variations on single independent variable in order to identify regularities and establish the relationship that exists between the elements in social world. Positivism supported this study goal since it aimed at working with observable reality (testing the impact of public debt on economic growth in Kenya). In this case the researcher collected data independently and analyzed with statistical tools.

#### 3.3 Empirical model

An empirical counterpart of equation from previous chapter may be obtained by introducing public debt and other macro-economic variables into the production as part of the X- vector of explanatory variables. Following the theoretical model from the previous section, the empirical model for this study may be expressed in general form as follows:

$$RGDP = F(ED, DD, TDS, PIGR, RER, RIR, \text{ and } INFL) \dots \dots \dots (3.4)$$

Where RGDP is the real annual output growth, ED is external debt, DD is the domestic debt, TDS is the total debt service, PIGR is the growth in private investment, RER is movement in real exchange rate, RIR is the real interest rate. In theory, private investment is a component of output and positively affects growth. In this study, private investment proxies the growth in the capital stock, inflation rate and real exchange rate are indices of macroeconomic stability in an economy. Real interest rate affects private output growth indirectly through private investment.

#### 3.4. Classical linear regression Model representation

Due to existence of theories linking the above variables, the GDP was functionally explained by the explanatory control variables. Further since the variables are time series, a time series regression model was fitted to analyze the variables as shown below;

$$RGDP_t = \beta_0 + \beta_1 PIGR_t + \beta_2 ED_t + \beta_3 DD_t + \beta_4 TDS_t + \beta_5 RER_t + \beta_6 INFL_t + \beta_7 RIR_t + \epsilon_t \dots \dots 3.5$$

$$PIGR = \beta_0 + \beta_1 RGDPT + \beta_2 RER_t + \beta_3 DD_t + \beta_4 TDS_t + \beta_5 RIR_t + \epsilon_t \dots \dots \dots 3.6$$

Where RGDPT= Real output growth at time t

PIGR<sub>t</sub>= the current Private investment as a percentage of GDP at time t

ED<sub>t</sub>= the current External debt as a percentage of GDP at time t

DD<sub>t</sub>= the current domestic debt as a percentage of GDP at time t

TDS<sub>t</sub>= the current total public debt service as a percentage of GNI at time t

RER<sub>t</sub>=Nominal real exchange rate as a percentage of GDP at time t

INFL<sub>t</sub>=Inflation given as a GDP deflator at time t

RIR<sub>t</sub>=Real interest rate in percentage at time t

$\epsilon_t$ = error term at time t

### 3.5 Data Collection Instrument

The study used time series secondary data in the study. A data collection guide was drawn to give data type, source and direction on the particulars of data relevant for the study as shown in appendix I. The annual financial data covered a period of 34 years (1980-2013). The data obtained relating to total public debt, external debt, domestic debt, public debt service, real exchange rate, real interest rate, inflation, private investment and real GDP totals was collected from KNBS economic data, World Bank and publications of Central bank of Kenya, statistical bulletins, economic and financial reviews. The data collected was in soft copy and as such the accuracy of information was high. This collection procedure was used because it was cost effective, reliable and valid.

### 3.6 Data Analysis and Presentation

The study used E-view 8 statistical package for data analysis and presentation of study findings. Quantitative data was analyzed using descriptive statistics which included; measures of tendencies (mean, medium,), measures of dispersion (standard deviation and range). Inferential statistics involved measurement and relationship which included correlation, regression and analysis of variance. The output of data analysis through e-views was presented in a tabular form. For clear presentation the output data was cleaned for better interpretation.

The study used Time Series Regression model in establishing the relationship between the variables. The overall objective aimed at determining the effect of public debt on economic growth in Kenya. Public debt comprised of domestic debt and external debt and its parameters and this informed specific objectives. Data analysis was therefore conducted according to the objectives where effect was captured through external debt, domestic debt and private investment. This helped to establish the existence of debt overhang, crowding out effect and the vulnerability of the country to the global economic policies; this revealed the credibility of the domestic policies and the strength of the Country's policy institutions.

### 3.7 Diagnostic Tests

**Test for Stationarity:** Time series data was assumed to be stationary hence unit root test was performed to establish stationarity of the variables. This is because use of non-stationary data leads to spurious results where test statistics exhibit a significant relationship between variables even when no such results exist (Riman and Eyo, 2008). The study employed the Augmented Dickey Fuller (ADF) and Kwiatkowski Phillips Schmidt-Shin (KPSS) tests procedure. ADF test is a standard procedure conducted to test whether a series has a unit root. However, the ADF criterion is known for its low power of the test. The KPSS test for unit root eliminates the possible low power against stationary near unit root processes; which occur in the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests (Greene, 1989).

It is a superior criterion because one can distinguish between series that appear to be stationary, series that appear to have unit root and series for which the tests are not informative on whether the series is stationary or integrated (Gujarati, 2003).

The basic equation used in the ADF test is expressed as:

(i) ADF without trend and intercept

$$\Delta Y_t = \rho Y_{t-1} + \sum_{i=1}^k \delta_i \Delta Y_{t-1} + \mu_t$$

(ii) ADF with an intercept but no trend

$$\Delta Y_t = \alpha + \rho Y_{t-1} + \sum_{i=1}^k \delta_i \Delta Y_{t-1} + \mu_t$$

(iii) ADF with both trend and intercept

$$\Delta Y_t = \alpha + \beta_t + \rho Y_{t-1} + \sum_{i=1}^k \delta_i \Delta Y_{t-1} + \mu_t$$

The ADF tests the null hypothesis that  $|\rho| = 0$  against the alternative that  $|\rho| < 0$  in the autoregressive equations.

For the KPSS criterion, the hypothesis tests for the series were:

$$Y_t = \beta D_t + \varepsilon_t$$

$$H_0: \sigma_\varepsilon^2 = 0 \Rightarrow Y_t I(0) \text{ Stationary}$$

$$H_a: \sigma_\varepsilon^2 > 0 \Rightarrow Y_t I(1) \text{ Non-stationary}$$

If the respective KPSS statistic is greater than the asymptotic critical value, the null hypothesis for stationarity is rejected. The decision is that the series is non-stationary.

**Normality test:** The study investigated whether the variables followed the normal distribution. This study relied on the Jargue- Berra test where a null hypothesis of normality was tested against the alternative hypothesis of non-normal distribution. For normal distribution the JB statistic was expected to be statistically indifferent from zero.

Ho: JB= 0 (normally distributed)

H1: JB  $\neq$  0 (not normally distributed)

Rejection of the null for any of the variables would imply that the variables were not normally distributed and a logarithmic transformation was necessary

**Heteroscedasticity test:** the study investigated whether the variance of the error term was constant. If the variance of the error term changes as the values of independent variable change then the assumption is violated. It is tested using the white test of statistics whereby we express the sum of errors as a function of independent variables in the model and regress it using the least ordinary square method. If there is no heteroscedasticity in the model we expected that all the coefficients were equal to zero.

**Autocorrelation test:** To test for autocorrelation the study used the Breusch -Godfrey test which is a joint test for autocorrelation that allows testing the autocorrelation of the error using several lags.

## CHAPTER FOUR

### RESEARCH FINDINGS AND DISCUSSIONS

#### 4.1 Introduction

This chapter presented the findings of the study, the estimation results and their interpretations.

#### 4.2 Data Characteristics

The study used annual time series data for the period 1980-2013. The sources of data included economic data from World Bank and financial data from Central Bank and the Kenya National Bureau of Statistics respectively. Data was collected for the following variables; private investment (PIGR), inflation rate (INFL), Real Gross Domestic Product (RGDP), real interest rate (RIR), total debt service (TDS), External debt ,domestic debt, and real exchange rate (RER).

Nominal data for these variables was collected. Real data was derived by dividing the nominal values by the GDP deflator and rebasing to the year 2009. This was because most of the variables were expressed as a percentage of GDP. Table 4.1 below describes the basic features of the real data for the variables. Descriptive statistics give summaries about the sample and they form a fundamental basis for every quantitative data analysis.

**Table 4. 1: Descriptive Statistics for Variables used in the study**

	RGDP	DD	ED	TDS	PIGR	INFL	RER	RIR
Mean	3.68	16.38	56.48	5.98	18.41	12.78	50.76	7.46
Median	3.96	16.52	49.58	5.81	18.66	10.84	58.37	6.28
Maximum	8.41	26.35	131.90	12.99	21.39	45.98	88.81	21.10
Minimum	-0.80	4.56	25.01	1.01	15.39	1.55	7.42	-8.13
Std. Dev.	2.36	4.73	25.24	3.68	1.75	8.90	28.33	6.89
Observations	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00

**(Source: Author, 2016)**

From the data presented in Table 4.1, the mean for real GDP growth rate over the period covered by the data averaged 3.68 per cent with a standard deviation of 2.36, with values ranging from a minimum of -0.80 to a maximum of 8.41. As for external debt as a percentage of GDP, the arithmetic mean value over the study period was 56.48 per cent with the standard deviation of 25.24 with real values ranging between a minimum of 25.01 and a maximum of 131.90 in 2010 and 1994 respectively. The high percentage value of external debt for the period 1994 could be attributed to cutting of aid by the bilateral and multilateral aid to Kenya due to economic mismanagement, shrinking of agricultural production in the previous year and expansion of the budget deficit. This period was also marked by high inflation rate of 45.98 per cent (maximum) and high real interest rate of 21.10 per cent. (RoK, 1995). Generally, basing on the means and standard deviation of the variables indicate that there are no outliers in the series since the standard deviation of the series is less than their respective means.

### 4.3 Diagnostic Tests for the Time Series Regression Model

Classical linear regression technique requires that all the necessary assumptions be made alongside the fulfillment of certain properties that must hold for the variables under study (Enders, 1995). Before estimation, these requirements were ascertained.

#### 4.3.1 Unit root test

Below are the unit root tests results.

**Table 4. 2: ADF Unit Root Test Results**

Variable	Form of test	Test Statistic	Conclusion
Real GDP growth	Intercept only	-3.430086**	Stationary
	Trend and intercept	-3.591418**	Stationary
Private Investment growth	Intercept only	-2.613570	Stationary
	Trend and intercept	-2.620905	stationary
External debt to GDP	Intercept only	0.6613	Non stationary
	Trend and intercept	0.4864	Non Stationary
Inflation rate	Intercept only	-3.301518**	Stationary
	Trend and intercept	-3.354335*	Stationary
Real interest rate	Intercept only	-3.879318***	Stationary
	Trend and intercept	-3.850743**	Stationary
Total debt service as a % of GNI	Intercept only	-1.471309	stationary
	Trend and intercept	-2.496243	stationary
Real exchange rate	Trend and intercept	-1.612385	stationary
	Intercept only	-0.927150	stationary
Domestic debt to GDP	Trend and intercept	0.0181	Non Stationary
	Intercept only	0.0232	Non Stationary

**Note:** \*\*\*Significant at 1% \*\* Significant at 5% \* Significant at 10% level

#### ADF Asymptotic Critical Values with intercept only

	t-Statistic
Test critical values: 1% level	-3.592462
5% level	-2.931404

10% level -2.603944

### ADF Asymptotic Critical Values with trend and intercept

	t-Statistic
Test critical values: 1% level	-4.252256
5% level	-3.518090
10% level	-3.189732

From the ADF criterion, the variables external debt and domestic debt were found to contain unit root. If the computed statistics greater than the asymptotic critical values in absolute terms, the null hypothesis that the series contained unit root was rejected and the series concluded to be stationary (Judge, 1985).

The KPSS stationarity test results are presented below:

**Table 4. 3: KPSS Stationarity Tests Results**

Variable	Form of test	Test Statistic	Conclusion
Real GDP growth rate	Intercept only	0.188015	Stationary
	Intercept and trend	0.132948	
Private Investment growth	Intercept only	0.163793	Stationary
	Trend and intercept	0.158765	
Inflation rate	Intercept only	0.139403	Stationary
	Trend and intercept	0.067346	
External debt to GDP	Intercept only	0.119000	Stationary
	Trend and intercept		
Real interest rate	Intercept only	0.153592	Stationary
	Trend and intercept	0.115701	
Total debt service as a % of GNI	Intercept only	0.543042	stationary
	Trend and intercept	0.149571	
Real exchange rate	Trend and intercept	0.133850	Stationary

	Intercept only	0.637806	Stationary
Domestic debt to GDP	Trend and intercept	0.119000	Stationary
	Intercept only	0.3470000	stationary

#### KPSS Asymptotic Critical Values with intercept only

		LM-Stat.
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

#### KPSS Asymptotic Critical Values with trend and intercept

Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

In the KPSS criterion, all variables were stationary at levels. This is because the computed LM test statistics were less than the asymptotic critical values for rejection of the null hypothesis at 1 per cent, 5 per cent or 10 per cent level of significance (Judge, 1985) either with intercept only, or with both trend and intercept. All the variables were therefore integrated of order I (0).

#### 4.3.2 Other Diagnostic Tests Results

A series of other diagnostic results were carried out to ascertain the statistical soundness of the models and whether they could be used for forecasting (Gujarati, 2004).

**Table 4. 4: Summary of GDP Model Diagnostic Tests Results**

Histogram-Normality Test	Jarque- Berra	0.755
	Probability	0.68
Breusch-Godfrey Serial Correlation Test	Observed R-squared	1.88
	Probability	0.39
Ramsey RESET Test	F-statistic	0.807
	Probability	0.378

**Table 4. 5: Summary of Private Investment Model Diagnostic Tests Results.**

Histogram-Normality Test	Jarque- Berra	0.754
	Probability	0.686
Breusch-Godfrey Serial Correlation Test	Observed R-squared	0.692
	Probability	0.708
Ramsey RESET Test	F-statistic	0.005
	Probability	0.944

#### 4.3.3 Discussion of Residual-Based Tests Results

A critical requirement in the classical linear regression is that the residuals must be normally distributed with zero mean and constant variance (Enders, 1995). The following sections report the diagnostic tests that were done for the regression models. Test was undertaken to establish whether the residuals were normally distributed.

The null hypothesis for the histogram-normality test is; the residuals are normally distributed, against the alternative hypothesis that the residuals do not exhibit normal distribution. The p-value for the Jarque-Bera statistic for the models for GDP, PIGR, were 0.755, 0.754 respectively; all of which are greater than 0.05, hence the null hypothesis could not be rejected. Conclusion was thus made that the regression residuals followed a normal distribution.

The study tested for the presence of serial autocorrelation amongst the estimated variables using the Breusch-Godfrey Lagrange Multiplier Tests. This test was postulated by Breusch (1978) and Godfrey (1978), being capable of handling higher order autocorrelation. The null hypothesis for this test is that there is no serial correlation, against the alternative that the variables are autocorrelated. The computed auxiliary R-squared for the B-G tests for the models had corresponding p-values of 0.39, 0.70 which are greater than 0.05, hence the null hypothesis of no autocorrelation could not be rejected at 5 per cent level of significance.

#### 4.3.4 Regression Specification Error Test (RESET) and Model Stability.

The preceding section discussed residual-based individual tests such as normality tests and serial autocorrelation tests. The tests results gave evidence that the estimation models satisfied all the OLS assumptions hence were desirable. To detect specification errors in a model which could have been mis-specified but nevertheless give desirable results, Ramsey and Alexander (1984) proposed Regression Specification Error Test (RESET) to establish departure from the classical linear regression assumptions.

This is a general test for omitted variable problem, correlation between the exogenous variables and the residuals and incorrect functional relationship in a model. The specification errors could be due to measurement errors of the regressors and expressing the endogenous variable as a function of its past values in the model.

**Table 4. 6: Summary of Ramsey Reset Test Results**

Ramsey RESET Test

Equation: PRIVATEIN

Omitted Variables: Squares of fitted values

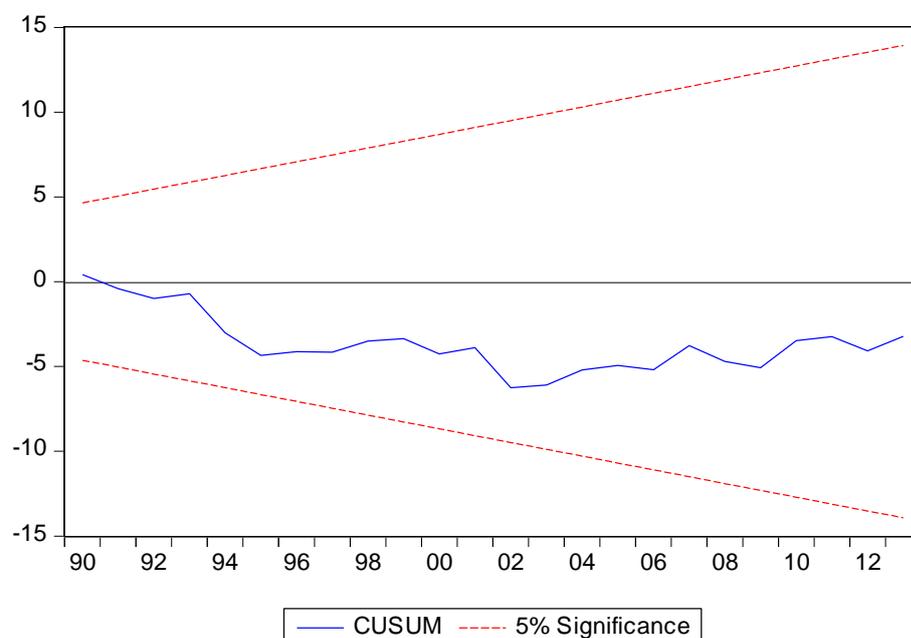
	Value	Df	Probability
t-statistic	0.071269	24	0.9438
F-statistic	0.005079	(1, 24)	0.9438
Likelihood ratio	0.006983	1	0.9334
F-test summary:			
	Sum of Sq.	Df	Mean Squares

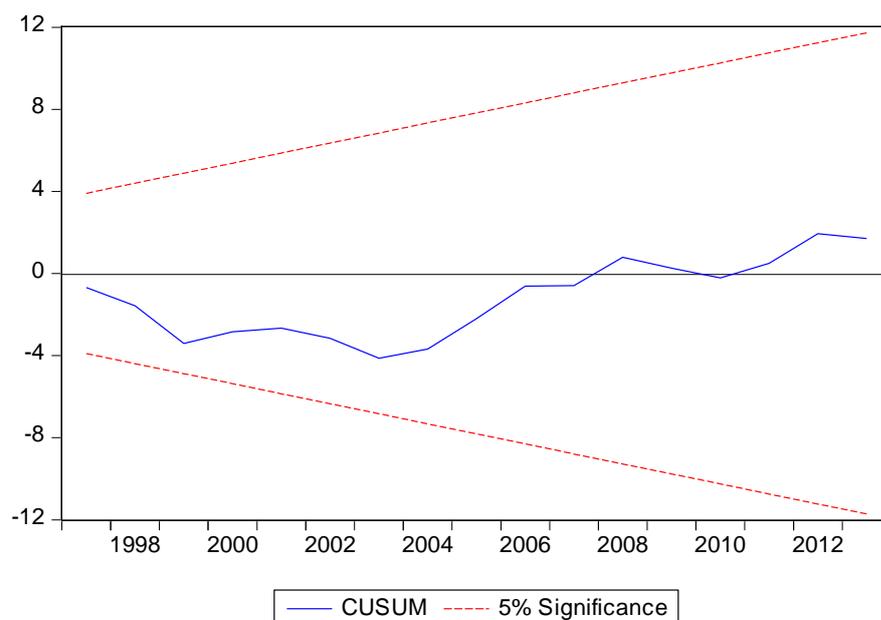
Test SSR	0.004119	1	0.004119
Restricted SSR	19.46546	25	0.778618
Unrestricted SSR	19.46134	24	0.810889
Unrestricted SSR	19.46134	24	0.810889
LR test summary:			
	Value	Df	
Restricted LogL	-38.11518	25	

The results indicated that the p-values (0.378, 0.944) for GDP, PIGR models respectively of the F-statistic were greater than 0.05 hence the null hypothesis of the model being correctly specified could not be rejected. This meant that the standard errors were correct and the F-statistics was valid.

Finally, stability test of the model’s recursive estimates was conducted on the estimated equation. In this regard, CUSUM tests were run. The results gave sufficient evidence to reject the null hypothesis of the model not being stable at 5 per cent level of significance. The results therefore supported the claim that the model is stable since the residuals lie within the dual standard error range. The CUSUM test results are shown below.

**Figure 4. 1: CUSUM Test for Stability of GDP model**



**Figure 4. 2: CUSUM test of stability of Private investment model**

In general, the estimation models for the effects of public debt on economic growth in Kenya were stable since they fulfilled all the necessary requirements for a good estimation model: sufficient coefficients of determination (R-squared above 60 percent), implying that the explanatory variables sufficiently explained the changes in the dependent variables; the F-statistic of the overall models, t-statistic and the corresponding p-values of most of the regressors were statistically significant; thus the parameters individually and jointly explained the changes in the regression (Greene, 1997).

The signs of the coefficients of the explanatory variables also met the expectation from economic theory. The residuals also satisfied all the necessary OLS assumptions. The diagnostic test results further yielded sufficient evidence of stability of the models and correct specification thus the estimated models are fit for forecasting.

#### **4.4 Times Series Regression for Model Gross Domestic Product**

The study estimated the effect of external debt and domestic debt alongside other macro-economic variables on output GDP 1. The study specifically focused on the direct effect of all

significant variables included in the study against the GDP1. The estimation results are discussed below.

### Estimated Equation

$$\text{GDP1} = \beta_0 + \beta_1 \text{RGDP}(-1) + \beta_2 \text{ED} + \beta_3 \text{INFL} + \beta_4 \text{PIGR} + \beta_5 \text{PIGR}(-1) + \beta_6 \text{RIR} \\ + \beta_7 \text{TDS} + \beta_8 \text{RER} + \beta_9 \text{DD} + \epsilon_t$$

### Substituted Coefficients:

$$\text{GDP1} = -0.43 + 0.29 \text{RGDP}(-1) + 0.07 \text{ED} - 0.23 \text{INFL} + 1.18 \text{PIGR} - 0.87 \text{PIGR}(-1) - 0.20 \text{RIR} \\ - 0.25 \text{TDS} + 0.02 \text{RER} - 0.09 \text{DD}$$

**Table 4. 7: Regression Output Results for GDP Growth**

Dependent Variable: RGDP

Method: Least Squares

MA Backcast: 1980

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.425790	2.660056	-0.160068	0.8743
RGDP(-1)	0.286805	0.144298	1.987591	0.0594
ED	0.066244	0.030673	2.159716	0.0420
INFL	-0.227653	0.046999	-4.843799	0.0001
PIGR	1.176974	0.201852	5.830867	0.0000
PIGR(-1)	-0.868908	0.198306	-4.381650	0.0002
RIR	-0.203285	0.042773	-4.752651	0.0001
TDS	-0.248908	0.247296	-1.006516	0.3251
RER	0.018731	0.014300	1.309871	0.2038
DD	-0.090458	0.046838	-1.931308	0.0664
MA(1)	-0.956046	0.077696	-12.30488	0.0000
R-squared	0.820139	Mean dependent var		3.622718
Adjusted R-squared	0.738384	S.D. dependent var		2.369508
S.E. of regression	1.211965	Akaike info criterion		3.483564
Sum squared resid	32.31490	Schwarz criterion		3.982400
Log likelihood	-46.47881	Hannan-Quinn criter.		3.651408
F-statistic	10.03168	Durbin-Watson stat		2.034306
Prob(F-statistic)	0.000004			
Inverted MA Roots	.96			

- The level of significance was 5%

From the estimation results, there was strong evidence of statistical significance of all the variables except total debt service and Real exchange rate in explaining economic growth.

The signs of the estimated coefficients were also consistent with the expectation from economic theory. Lagged GDP, private investment and external debt were found to affect economic growth positively, whereas inflation rate, real interest rate, domestic debt and previous period's investment had negative effect on economic growth. The signs of their corresponding coefficients show consistency with expectation from economic theory.

The coefficient of determination, R-squared (0.82) indicated that the right hand side variables accounted for around 82 percent of the variations in real GDP. Similarly, the p-value (0.000004) of the F-statistic indicated that the overall model was significant in explaining the relationship. Durbin-Watson statistic (2.03) implied no serious autocorrelation problems.

The positive effect of external debt (0.06) on economic growth showed that there is no existence of debt overhang effect in Kenya. This meant that the country could meet its debt obligations without requiring much relief. Due to multiplier effect, the return on the investment of the borrowed funds sufficiently meets the cost of servicing the debts. It also means the money meant for infrastructure is directed towards paying the domestic debt which in future could bring the problem of debt overhang.

The current study concurs with the study done by Cholifihani (2008) on long term and short term relationships between public debt service and GDP in Indonesia by applying co integration analysis of time series model from 1980 - 2005. These relationships used an extended production function model that measured GDP as a function of debt service, capital stock, labor and human capital. The result show that Indonesia faces a debt overhang problem in the long run since increasing the public external debt service slows economic growth

Makau (2008) study on analysis of external public debt servicing and economic growth in Kenya indicated that the Kenya's external debt is mainly official and is significant in Kenya.

It concurs with the current study which indicated that the external debt although affecting the GDP positively is significant and official.

#### 4.5 Time Series Regression for Model private investment

The study further sought to find out the effect of domestic debt on the growth of private investment. The study specifically focused on the direct effect of all significant variables included in the study against the PIGR. The aim was to find out the existence of crowding out effect of private investment due to borrowing excessively and vulnerability of other macro-economic variables to adverse shocks from the market.

#### Estimated Equation

$$\text{PIGR} = \beta_0 + \beta_1 \text{PIGR}(-1) + \beta_2 \text{RGDP} + \beta_3 \text{RER} + \beta_4 \text{DD} + \beta_5 \text{TDS} + \beta_6 \text{RIR} + \epsilon_t$$

#### Substituted Coefficients:

$$\text{PIGR} = 9.103266 + 0.560098 \text{PIGR}(-1) + 0.319597 \text{RGDP} + 0.014658 \text{RER} - 0.193459 \text{DD} + 0.020247 \text{TDS} + 0.077625 \text{RIR}$$

**Table 4. 8: Regression Output Results for Private Investment**

Dependent Variable: PIGR

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
*PIGR(-1)	0.560098	0.106862	5.241312	0.0000
*RGDP	0.319597	0.071328	4.480687	0.0001
RER	0.014658	0.012135	1.207876	0.2384
C	9.103266	2.610577	3.487070	0.0018
*DD	-0.193459	0.076261	-2.536795	0.0178
TDS	0.020247	0.074110	0.273209	0.7869
*RIR	0.077625	0.028100	2.762503	0.0106
*D1	-4.790260	1.109153	-4.318845	0.0002
R-squared	0.807330	Mean dependent var		18.41013
Adjusted R-squared	0.753383	S.D. dependent var		1.776850
S.E. of regression	0.882393	Akaike info criterion		2.794859
Sum squared resid	19.46546	Schwarz criterion		3.157649
Log likelihood	-38.11518	Hannan-Quinn criter.		2.916927

F-statistic	14.96511	Durbin-Watson stat	2.230788
Prob(F-statistic)	0.000000		

- The level of significance was 5%

From the estimation results, total domestic debt (-0.193) with p-value 0.0178 affected private investment negatively. According to the liquidity constraints theory, when a country's domestic debt burden is so heavy that a significant portion of its current output accrues to lenders, it crowds out private investment.

The other variables that showed strong statistical significance in this relationship were: real interest rate (0.077), gross domestic product growth (0.32) and previous period's investment (0.56) with p-values 0.01, 0.0001 and 0.0000 respectively; all less than 0.05. The data analyzed indicated that taking all other independent variables at zero, a unit increase in domestic debt led to a -0.193459 decrease in private investment as presented in the above equations.

The coefficient of determination, R-squared (0.81) indicated a significant percentage of above 80 per cent variations in private investment being explained by the right hand side variables; evidence of the goodness of fit of the model. The p-value of the F-statistic (0.0000) further revealed a strong evidence of the overall significance of the estimated model for forecasting. The study therefore found out crowding out effect of private investment.

The findings of this study are consistent with the finding of (Akram, 2010) study on impact of public debt on economic growth in Pakistan. The study concluded that public debt results in deteriorating economic growth process, partly because it adversely affects investment. This study concurs with the current study which indicates that public debt affect economic growth negatively and should be contained.

The findings of this study are similar to the finding of Maana et al., (2005) study on impact of public debt on private investment in Kenya. The author found out that high levels of domestic borrowing have negatively impacted on private investment and it crowds out private investment. Finally the findings of the current study concurs with the findings of the study carried by Putunoi and Mutuku (2013) on domestic debt and economic growth in Kenya that excessive domestic borrowing can be inflationary and may crowd out private sector borrowing.

The study conformed to the study done by Clements et al., (2005); higher external interest payments can increase a country's budget deficit, thereby reducing public savings if private savings do not increase to offset the difference. Debt service may discourage growth by squeezing the public resources available for investment in infrastructure and human capital.

## 1.0 Conclusions

The study was conducted with a view to establishing the effect of public debt on economic growth in Kenya over the period 1980-2013. To accomplish the task a times series regression model for real GDP and investment function were specified and estimated considering external debt, domestic debt, real exchange rate, real interest rate, inflation and private investment, as independent variables. Using the times series regression model, the effect was analyzed and diagnostic tests were carried out to ensure the data was stationary, normally distributed and not serially related to avoid spurious results. The main findings of the study confirmed with statistical significance that increasing the levels of domestic debt crowd out private investment since real interest rate, lagged private investment, domestic debt and inflation affected Real GDP negatively and in the long run the increased level of external debt will cause debt overhang problem since the total debt service affected the Real GDP negatively.

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