IMPACT OF CAPITAL AND RECURRENT EXPENDITURE ON PUBLIC DEBT IN KENYA

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DECLARATION

This research project is my original work and has not been presented for award of a degree or any other award in any other university.

Signature ……………………   Date …………………………………….

SHARON AKINYI AMAYO

X51/6236/2017

This research project has been submitted for examination with my approval as university supervisor.

Signature……………………   Date…………………………………….

 Dr. Laura Barasa

DEDICATION

To my parents and the entire family of Mr. and Mrs. Amayo.

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I am grateful to the Almighty God for the gift of life and good health, His grace guidance and providence to this end.

I would like to acknowledge the support and sacrifice from my parents and siblings in seeing me through this academic investment.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF   : Augmented Dickey Fuller

GDP   : Gross Domestic Product

GoK   : Government of Kenya

HIPC   : Highly Indebted Poor Countries

IFMIS   : Integrated Financial Management Information System

IMF   : International Monetary Fund

LICs   : Low Income Countries

MTEF   : Medium Term Expenditure Framework

OECD   : Organization for Economic Cooperation and Development

PBB   : Programme Based Budget

PEM   : Public Expenditure Management

VECM   : Vector Error Correction Model

ABSTRACT

Public expenditure is a fiscal policy measure taken to influence a country's economy and is therefore an important tool for boosting economic growth. In Kenya, the level of spending is way higher than the revenue collected hence budget deficits are majorly financed through public debt. However, the soaring levels of debt overtime have become a problem for the government even as it continues to expand its debt ceiling overtime.

This study sought to investigate the long run relationship between public debt and the productive and non- productive components of expenditure i.e. capital and recurrent expenditure. The study utilized the endogenous growth model to study this relationship. Annual time series data for public debt, capital expenditure, recurrent expenditure and interest rates were collected from various Economic Surveys and Annual Public Debt reports between 1980 to 2015. Augmented dickey fuller and Philip Perron tests were used to test the stationarity of the data and the Johansen cointegration test was utilized to determine presence of long run relationship.

Vector error correction model (VECM) was used for analysis since cointegration was established in the series. The results showed that there was a significant positive relationship between public debt and recurrent expenditure and a significant negative relationship between public debt and capital expenditure. It also found that the government of Kenya borrows heavily to finance its recurrent expenditure thus explaining the continued rise in the level of public debt.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Every country seeks to fulfill a set of macroeconomic goals. These include achieving full employment, reducing inflation and high economic growth. The government applies a combination of fiscal and monetary policy to improve a nation's economy. The use of taxation and government spending to achieve macroeconomic goals is referred to as fiscal policy (M'Amanja & Morrissey, 2005). The government may use either expansionary or contractionary fiscal policy together with monetary policy to meet these goals. Fiscal policy is said to be expansionary if it involves reducing taxation and increasing government spending in order to encourage economic activity during a recession. On the other hand, contractionary fiscal policy involves increasing tax and reducing government spending which aids in monitoring inflation (Aschauer & Greenwood, 1985).

Public expenditure, otherwise known as government spending, refers to any amount the government spends on goods and services. Valentino (2001) pointed out that public expenditure is the sum of services and goods purchased by a nation for its utilization in form of consumption, transfer payments and investments. This may be effected through provision of health services, education and infrastructure such as roads. Government investment increases income leading to increased spending in the economy. This boosts production thus creating more income (Keynes, 1929). According to Keynes, higher government spending boosts economic growth, thus he advocated for increased public spending financed by public debt. When the government spends, consumer demand increases leading to a rise in economic activity thereby reducing inflation and unemployment.

Barro, (1990) classified public expenditure into two groups namely productive and non-productive expenditure. Productive expenditure refers to purchase of goods and services by the government meant to increase income and improve the productivity of an economy such as investment in parastatals, infrastructure development, or agriculture sector development while non-productive expenditure is spending in sectors that do not generate income or returns to the

government such as payment of salaries and allowances, defense, public administration, law and order and interest payments.

In Kenya, the spending process begins with the annual budget prepared by the National Treasury and presented to parliament for approval in the month of June of every year. Currently, the government uses the medium term expenditure framework (MTEF) and the Programme Based Budget (PBB) as methods of public finance management reforms. The MTEF is plan that is implemented in three year terms and seeks to link policy making, planning and budgeting. In Kenya it was first implemented in the 2001/2002 financial year though it is a method that has been used in other countries from as early as 1980. On the other hand, PBB is used to organize the budget around objectives rather than inputs. It enhances transparency in terms of who is spending, by how much and whether this spending is in line with the set goals (GoK, 2018a).

Public debt refers to the sum total of government obligation both at the local government level and national levels. It may be either from domestic or foreign sources. Domestic debt is money a government owes its citizens usually from commercial banks and other financial institutions within the country while foreign debt is money owed to foreign countries, banks and financial institutions. Previous studies on public debt have concentrated on external debt because external borrowing can increase a nation's access to resources while domestic borrowing only transfers resources within the country (Muinga, 2014; Putunoi & Mutuku, 2013).

Public debt is a major macroeconomic indicator that is used to create a picture of how a country is performing in the global arena (Abbas & Christensen, 2007). It's a method of financing budget deficits adopted by many countries during times of economic depression. Budget deficits occur when the government spends more than it raises in terms of revenue. The major source of revenue in most nations is taxation and this is usually not sufficient to finance economic activities thus leading to borrowing to bridge the gap. The government is therefore expected to strike a balance between the tax revenue level and debt levels to ensure long run financial soundness and economic stability (Silva, Carvalho, & Ribeiro, 2013) However, economists from different schools of thought have divergent views on the need to borrow to finance budget deficits. Smith (1863) advocated that governments should not run budget deficits

as it leads to borrowing which will eventually lead to an increase in taxation to service the accumulated debts. Smith proposed the use of balanced budgets financed entirely through taxation expect during emergencies such as war or natural disaster when it can run budgets deficits or borrow. Debt curtails a countries development in amassing wealth because resources meant for promoting economic growth in the productive sector are allocated to non-productive sectors (Smith, 1863). According to Smith taxation only decreases household expenditure while debt decreases their savings. While taxation discourages new investment thus affecting capital formation, debt affects productive activity by displacing funds meant to pay productive labor to unproductive activities. Keynes however advocates for borrowing to finance spending by government for improved economic growth.

1.1.1 Public debt and public expenditure trend in Kenya

Figure 1 shows the public debt and public expenditure trend as a percentage of gross domestic product (GDP) between the year 2011 to 2018. An upward trend is observed in both debt and expenditures as a percentage of GDP. Debt grew to 5.04 trillion in June 2018 (57.1% of GDP) from 1.89 trillion in June 2013 (42.1% of GDP). Government spending as a percentage of GDP was highest in 2015 and 2017 during the period of review. In 2017, this was majorly contributed by the general election that was repeated after the supreme court ruling due to several anomalies from the initial election. Between 2013 and 2015, public expenditure rose from 23.7% to 27.5%. This was majorly because of devolution with the introduction of county governments. However, the national government spending still remained high despite the fact that other roles have been devolved to the county government levels. Government expenditure in Kenya is also higher than the average regional level of 20.1% as compared to its neighbors Uganda, Tanzania and Ethiopia**.**

Figure 1: Debt and expenditure growth trend in Kenya1
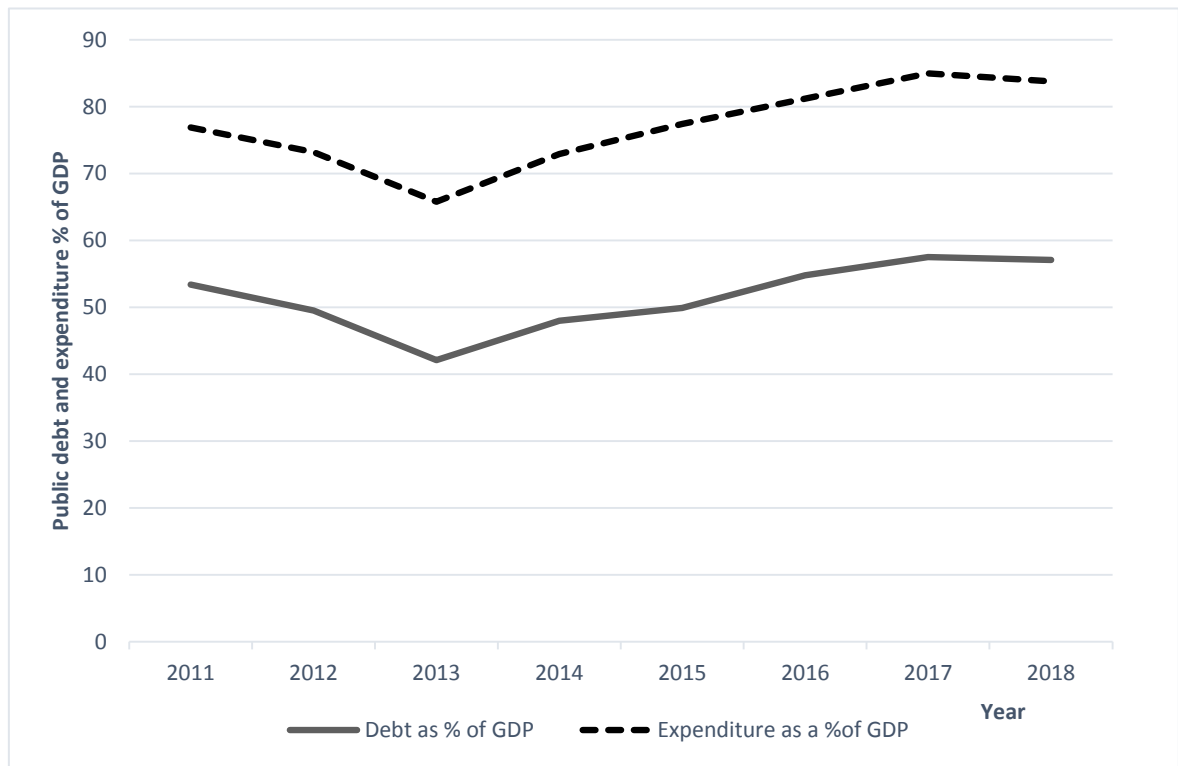
Source: Various Economic Surveys (GoK)

1.2 Statement of the problem

The International Monetary Fund (IMF) has placed the benchmark of debt- GDP ratio at 74% for low income countries (LIC's). Kenya's debt to GDP ratio is currently at 56% which is considered sustainable given that it is below the benchmark set for LIC's. However ,IMF's projection on future debt to GDP ratio indicates a worrying trend as they foresee that the ratio of debt to GDP will continue to increase and eventually breach the benchmark of 74% by 2022 (GoK, 2018). Public debt in Kenya has been increasing overtime with repayment efforts proving to be a major challenge as some are as old as from 50 years back. Government expenditure continues to exceed revenue collected leading to debt financing to bridge the gap. Revenue averaged 18 percent of GDP hence fiscal expansion has been achieved through debt (GoK, 2018b). Such debt is expected to be invested in productive activities of the economy so as to raise

enough income to pay back the debt, however this appears not be the case in Kenya. Over the past few years, the level of public debt rose from 43.6% of GDP in 2007 to 57.1% of GDP in 2018 (GoK,2018). The upward trend was caused by higher spending on infrastructural projects funded purely through debt for instance the standard gauge railway.

Gana (2002) state that foreign borrowing should be encouraged as it boosts growth of the economy if the funds are injected in the sectors of the economy that are productive. The government may opt to allocate the debt to productive or nonproductive sectors of the economy. (Muthui, Kosimbei, Maingi, & Thuku, 2013) studied the impact of government expenditure on economic growth and concluded that infrastructure development contributed positively to economic growth as opposed to consumption expenditure.

Therefore, the choice of projects to invest in by the government is a core determinant of an economy's performance as it may either lead to capital formation and increased income or stagnation of the economy. In Kenya and many other less developed countries the political class influence allocation of funds to projects which are eventually embezzled and no benefit is derived from such projects. Such allocations are inefficient in growing the economy since only corrupt leaders are bound to benefit. Expenditures on projects that have no social or economic benefits "white elephants", grants in form of aid or cash from the government , and funding government parastatals that always make losses usually benefit politicians and specific geographical areas affiliated to the leaders with no advantage to the rest of the nation (Krueger, 1990).

This study sought to establish whether government spending allocations were efficient in sustaining the level of debt.

1.3 Study objectives

1.3.1 General objective

The main objective of this study was to analyze the impact of capital expenditure and recurrent expenditure on public debt.

1.3.2 Specific objectives

The specific objectives were to:

(i) Establish the relationship between public debt, capital expenditure and recurrent expenditure in Kenya.

(ii) Investigate how public debt responds to changes in capital and recurrent expenditure in Kenya and draw policy implications.

1.4 Significance of the Study

The role of government in ensuring the level of debt is sustainable without overstepping the implementation of budget is underscored in section 15 of the Public Finance Management Act and is fundamental in ensuring economic growth. This study is therefore significant as policy implications that will arise will help the government in adjusting their expenditure allocations towards ensuring more sustainable debt levels and improved economic growth.

Furthermore, it will contribute to existing literature and knowledge in the field of study as the study findings will be useful to other researchers, the government and international institutions that offer both financial advice and lending to the country.

1.5 Scope and Organization of the Study

The study period used in this research is between 1980 and 2015. This period is specifically critical since a number of events and policies important to the economy were adopted. For example, vision 2030, post-election violence in 2007, implementation of MTEF policy in 2001/2002, IFMIS in 2005 and devolution in 2010. It is therefore a significant period to examine the impact of such events on spending and public debt.

The remaining part of the study is presented as follows: chapter two reviews theoretical and empirical literature and also gives an overview of literature. In chapter three the research methodology is outlined. Chapter four presents the model estimation and data analysis while the summary, conclusion and policy implications of the study are presented in chapter five.

CHAPTER TWO: LITERATURE REVIEW

2.1 Theoretical literature

2.1.1 Theory of allocative efficiency in public expenditure

Allocative efficiency is the ability of the government to allocate and distribute resources to public projects and programs based on their effectiveness in achieving the set goals and targets (Schick, 1998). This is done through a clear budget system where the government may shift or reallocate resources from previous projects to new ones or from inefficient projects to efficient projects. In order to make efficient allocations, the government needs to be not only objective but also strategic by establishing what it wants to achieve in the future and look back and evaluate previous results. Moreover, the government should seek to allocate efficiently in both extremes of fiscal conditions i.e. whether the budget is shrinking or growing. In both cases, the government should ensure it spends its least abundant resources on programs that generate the highest social benefit.

Finding the link between evaluation and planning in the budget process has been a recurring issue in management of public spending. According to the World Bank (1998), while many governments have tried to implement this in their budget processes, its success rate has been dismal due to increase in informational burdens, transaction costs and political conflict. Informational burdens have increased because of the need for more data on program impacts while political conflicts arise from measures taken to redistribute resources. However, it should be noted that the top most priority of public expenditure management (PEM) is to improve efficiency of allocation without overstretching the government's ability to go through information and handle conflict.

Classical economists argued that budgets should seek to allocate efficiently by ensuring that a good budget is prepared and all claims are taken care of exhaustively. However, due to incremental patterns in the budget, structural impediments such as stickiness of public expenditure, time frame of the budget and lack of information on program effectiveness became

evident. Public expenditure tends to be sticky due to difficulty in withdrawing funds away from existing programs to new ones. On the other hand, due to annual budgeting, it becomes a problem to reallocate funds for programs whose impacts lie in the future and their reallocations unfold over a number of year, thus the timeframes of the budget become a hindrance. Finally, when allocating inputs budgeting does not consider whether funded programs are achieving the set government objective(Dollar, 1990).

The most recent reforms in the budgeting process include zero based budgeting and planning programming budgeting system (PPBS). While the two methods are different in their processes, both seek to increase competition for budget resources. PPBS gives budgeting an extended time frame and improved ability to analyze projects by providing information on other cost effective alternatives of achieving government objectives while ZBB seeks to redistribute resources among the existing programs within the budget as it requires that every unit to be spent on to have a substitute budget (Schick & World Bank, 1998).

2.1.2 Adolf Wagner's hypothesis

This hypothesis is also referred to as the increasing state spending law and was founded by Adolf Wagner (1835-1917). Wagner was of the opinion that government spending increases with expansion of income in the economy (Wagner, 1883). Therefore, as an economy grew, there was need for the state to increase its spending on the public sector. This is attributed by the requirement that the government takes part in social and economic activities and for other historical reasons. Social activities of the state include payment of retirement and pension funds, protection of the environment and natural disaster aid. Economic aspects comprise of investing in new technology, scientific research and investment projects as the country industrializes. Historical reasons such servicing debt incurred in the previous years both domestically and from foreign sources was also found to contribute to the increasing state spending. Bird, (1971) asserts that public sector will grow with an almost proportional value as the growth in income rises.

According to Wagner, as income grows conflicts among individuals are bound to increase especially in densely populated urban areas as everyone is out to make more money for

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themselves. This will require that the government intervenes in regulation, maintaining law and order and providing a security service which in turn increases the state expenditure (Easterly & Rebelo, 1993). The replacement of private for public sector leads to increase in government regulation resulting to higher expenditure. As economies become more complex the rate and enormity of market failures would compel the state to become more regulatory in nature, thereby increasing its role and this would unavoidably involve higher public expenditure (Dhiresh, 2013).

2.1.3 Peacock and Wiseman hypothesis

This theory was founded in 1961 by Peacock and Wiseman. (Peacock, Wiseman, & Veverka, 1967) argued that public expenditure increases in a stepwise manner and not in a constant rate thus establishing a time pattern for analyzing public expenditure growth. The authors also noted that due to social and other disturbances the government may need to increase their expenditure which may not be able to be met by the existing levels of revenue. With these low levels of revenue, the government may be forced to borrow thus increasing public debt or increase their revenue collection by adjusting taxes upwards.

When there is peace, the government expenditure cannot be increased due to limited taxation thus limited revenue. The general perspective bout taxation is fairly stable during peace times as citizens cannot accept nor understand why they should be taxed highly in such times. Therefore, the government cannot meet its desired level of public expenditure.

However, in times of war or an outbreak of a social disturbance, the divergence between taxation and expenditure is reduced as the tax burden increases to finance the war. At this point, increasing tax is generally accepted by the citizens. Even after the war, this tax rate is maintained and the government is able to fund its expenditure programs. Due to such social disturbances, Peacock and Wiseman identified three effects that arise namely; the displacement, inspection and concentration effect.

The displacement effect occurs when a country experiences a social disturbance at a given point in time such a natural disaster, political upheaval or war. This causes the government to increase its expenditure so as to return the economy back to normal. The restructuring of public

expenditure is what is referred to as displacement effect. In Kenya incidences such as post-election violence, drought and famine are some of the disturbances that have led to a substantial increase in government expenditure.

As a country goes through the displacement effect, the government tends to discover other problems that were previously not noted. A higher public expenditure level is reached and the government will device means of increasing revenue through higher taxes. This creates a new equilibrium above the initial equilibrium and is referred to as the inspection effect.

Even after the social disturbance let's say war has ended, the government will retain the increased tax rate. The new high equilibrium level is maintained in the economy and this is referred to as the concentration effect. The economy can grow after such a disturbance as the high equilibrium is maintained until another social disturbance occurs and this cycle is repeated. This is called the concentration effect.

2.2 Empirical literature

Extant literature demonstrates a positive correlation between productive public expenditure and economic growth (Masaviru, 2012; Muthui et al., 2013). Globally, several studies conducted where researchers have differentiated between productive and non- productive components of government spending have shown how a country can boost its economic growth by altering the mix between the two forms of expenditure (Barro, 1990a; Bleaney, Gemmell, & Kneller, 2019). However little information is available on how public debt and public expenditure interact.

Barro (1990) studied the relationship between the size of government expenditure and growth and saving rates. Using data from 98 countries from sub-Saharan Africa and Latin America during the period 1960-1985 and incorporating the public sector into the growth model, the author grouped expenditure into productive and unproductive expenditure. With the beginning per capita GDP levels, Barro established that rate of growth is positively related to starting amount of human capital hence poor countries can succeed in reaching the rich countries growth levels if they increase human capital per individual. The author also found that the growth of an economy has a negative relationship with public spending to GDP ratio and a positive correlation

exists between growth of output and public investment. The ratio of spending on government consumption to GDP was negatively correlated with private investment to GDP ratio and per capita growth. The author concluded that a rise in resources spent on the unproductive sectors leads to decreased economic growth.

Bleaney et al., (2019) studied the effects of government expenditure and taxation on growth. The authors used 22 OECD countries panel data from 1970 to 1995. The study findings showed that productive expenditure exhibited a positive correlation with growth and that a combination of non-distortionary taxes and productive spending boosted growth while non-productive spending and distortionary taxes were growth retarding. The authors concluded that productive government spending affected productivity of private sector thus it had a direct impact on growth. However non-productive expenditure, which had an influence on the welfare of citizens would have an inverse or no impact on growth.

Cassimon (2014) conducted a study on the fiscal response of debt relief in 28 highly indebted poor countries (HIPC) and established that debt relief increased revenue collected and advocated for growth in both recurrent and development expenditure. The author found that government consumption is financed mainly through taxation and other sources revenue while long term development projects were financed through grants and domestic borrowing. Nations that received debt relief were able to reduce their external borrowing hence alluding to their inclination towards defensive lending hypothesis.

Folster and Henrekson (2000) studied effects of growth of government expenditure and taxation in developed countries. The authors used data from a sample of developed countries between 1970-1995. From the panel data regression, the authors established that expenditure and economic growth had a negative correlation in developed countries. The results of their study showed that growth rate decreased with higher expenditure in developed countries. Government spending and taxation both had an inverse relationship with economic growth when the developed country sample was used on non-OECD countries.

Masaviru (2012) conducted a study to determine if the public expenditure composition mattered to economic growth of Kenya. Data for the period 1972-2008 on components of public spending such as health, defense, transport, education and economic affairs were differenced and linearized for estimation using OLS. The author established that spending on education was highly significant on growth of the economy while those of transport, communication and economic affairs were significant but weakly. Agriculture spending was significant but impacted negatively on growth and spending on health and defense were found not to be significant.

Muthui et al., (2013) studied the impact of government expenditure composition on economic growth in Kenya between 1964 to 2011. Applying vector error correction method, the authors found that economic growth is enhanced when government spending is channeled towards education and development of physical infrastructure. Spending on security, public order, debt servicing, salaries and health had a negative effect on growth. The authors concluded that infrastructure development spending boosted economic growth greatly than spending on consumption.

Njeru (2004) carried out a study on the impact of foreign aid on public expenditure in Kenya between 1970-1999. The author established that foreign aid influenced how the government chooses to spend. Development spending increased by a greater percentage when foreign aid was increased than when domestic resources are increased. The study also found that freezing of foreign aid leading to a fiscal crisis influenced government spending only in the short run. Aid freezing had a greater effect on development spending than on recurrent spending.

Reinhart and Rogoff (2010) studied growth in a time of debt, using data from 44 countries spanning about 200 years. The study found that for countries whose ratio of debt to GDP was lower than the 90% threshold, the relationship between government debt and real GDP growth was weak. In a corresponding study (Herndon, et al.,2014) found that, public debt impacted positively on the growth of the economy and that the higher the debt to GDP ratio, the lower rate of growth of the GDP. For example, given a public debt to GDP ratio below 30%, the GDP grew by 4.1%. However, if the ratio of public debt to GDP is above 90%, growth rate decreases by 2.2%.

Uguru (2016) studied the relationship between public debt and public expenditure in Nigeria between 1980-2013. The author used time series data for public debt, capital expenditure and recurrent expenditure and tested the model using OLS. Uguru found that government debt and government expenditure in Nigeria had a significant relationship. The author also established that the effect of recurrent expenditure on public debt was greater than that of capital expenditure in Nigeria and concluded that Nigeria should lower its spending on recurrent expenditure and increase their spending on capital expenditure to achieve its vision 2020 goals.

2.3 Overview of literature

Theories applied reveal that growth of public expenditure stimulates the growth of a nation's economy as explained by Adolf Wagner and Peacock and Wiseman theories. The allocative efficiency theory emphasizes on the need for proper allocation of public spending in order for a nation to achieve its set goals and objectives.

Empirical literature on the other hand shows that there is minimal literature linking public expenditure and public debt as most studies focused on the relationship between public expenditure and economic growth. Muthui et al.,(2013) for example studied the impact of public expenditure composition on economic growth while Njeru (2004) concentrates on the impact of foreign aid on public expenditure. However, there has been no study in Kenya that links public debt with the productive and non-productive components of expenditure in Kenya namely capital and recurrent expenditure respectively. This study therefore contributes to literature by bringing a closer focus on how public debt and public expenditure components interact.

CHAPTER THREE: METHODOLOGY

3.1 Theoretical framework

This study adopts Barro (1990) and Greiner, (2007) endogenous growth models to establish the relationship between public debt and capital and recurrent expenditure. Barro (1990) incorporated the public sector into the growth model by explaining government activities in terms of tax collected from private agents. Borrowing from Le, Van and Nguyen-van (2015),the budget constraint can be written in general form as:

$$G_t + (r_t^B + 1)B_t + (r_t^D + 1)D_t = T_t r_t^A A_t + B_{t+1} + D_{t+1}$$

(1)

Where G_t is the government expenditure flow, r_t^B is the rate of interest on external debt and r_t^D is the rate of interest on domestic debt, B_t and D_t are external and domestic debt respectively. T_t is rate of tax on asset returns, r_t^A is the rate of interest on assets and A_t is stock of asset.

The left hand side of equation (1) represents government expenditure at period t. The government spends on its direct expenditures and payment of interest and capital for local and foreign debt. On the right hand, revenue in period t is raised by collecting taxes from private agents and also borrowing both domestically and externally to finance deficits that may arise.

To ensure debt sustainability, Greiner (2007) assumed that the public debt threshold should not be above a given percentage of total production.

$$G_t + n(B_t + D_t) \leq \emptyset Y_t + T_t r_t^A A_t$$

(2)

Where $\emptyset$ measures if primary surplus levels rise or fall as increases domestic income and n determines the strength of primary surplus response to changes in domestic and external debt.

Equation 2 can be rewritten as;

$$(G_t - T_t r_t^A) + n(B_t + D_t) \leq \emptyset Y_t$$

(3)

The above equation shows that domestic and external debt can be used to fund the budget deficit with a percentage of production set aside to cover for the debt.

Reinhart & Rogoff (2010) also observed that the ratio of primary surplus to GDP and debt to GDP ratio were positively correlated as shown below:

$$\frac{T_t r_t^A A_t - G_t}{Y_t} = -\emptyset + n\frac{B_t + D_t}{Y_t}$$

(4)

From equation (1), if we let r_{t-1}^{BD} be the average interest rate for both domestic and external debt:

$$r_t^{BD} = \frac{B_t}{B_t + D_t} r_t^B + \frac{D_t}{B_t + D_t} r_t^D$$

(5)

Total public debt (TPD) can therefore be written as:

$$B_{t-1}(1 + r_{t-1}^B - n) + D_{t-1}(1 + r_{t-1}^D - n) = (B_{t-1} + D_{t-1})(1 + r_{t-1}^{BD} - n)$$

(6)

3.2 Empirical model

Since the study is on the relation between debt and expenditure, we can write our debt - expenditure model as follows:

$$Y = C + I + G - NX + TPD$$

(7)

Where:

$$C = C_0 + C_1$$

$$I = S - C$$

$$G = capital\ exppenditure + recurrent\ expenditure$$

$$NX = exports - imports$$

$$TPD = (B_{t-1} + D_{t-1})(1 + r_{t-1}^{BD} - n)$$

where S is savings and n is the debt sustainability parameter.

The functional expression for estimating the study was:

$$TPD = f(CEXP, REXP, INTRT_F, INTRT_D)$$

$$(8)$$

Where TPD is the total public debt, $CEXP$ is the government capital expenditure, $REXP$ is the government recurrent expenditure and $INTRT_F$ is the foreign interest and $INTRT_D$ is the domestic interest on debt.

The linear specification for Equation 8 is:

$$TPD = \beta_0 + \beta_1 CEXP + \beta_2 REXP + \beta_{3INTRT_F} + \beta_4 INTRT_D + \varepsilon$$

$$(9)$$

Where ε is the error term and β_1 to β_4 are the parameters to be estimated

To achieve the most appropriate coefficients, equation 9 was transformed to its natural logarithmic form as follows:

$$lnTPD = \beta_0 + \beta_1 lnGCEXP + \beta_2 lnGREXP + \beta_3 lnINTRT_F + \beta_4 lnINTRT_D + \varepsilon$$

$$(10)$$

3.3 Data type and source

The study used annual time series data ranging from 1980-2015 for Kenya in its regression analysis. Data was obtained from various Economic surveys by the Kenya National Bureau of Statistics (KNBS) and Annual Public Debt Reports by The National Treasury.

3.4 Definition and measurement of variables

Table 3.1 Definition and measurement of variables

Variable	Measurement	Expected sign
Total public debt	Debt obligations in Kshs	**+ve** (Uguru,2016)
Capital expenditure	Productive expenditure in Kshs	**+ve** (Uguru,2016)
Recurrent expenditure	Non-productive expenditure in Kshs	**+ve (**Uguru,2016)
Foreign interest	Interest paid on foreign debt in Kshs	**+ve (**Uguru,2016)
Domestic interest	Interest paid on domestic debt Kshs	**+ve** (Uguru,2016)

3.4 Econometric issues

3.4.1 Unit root test

Time series data was used for analysis in this study. It was important to conduct unit roots tests to ensure the data was stationary and find the integration order of the series to be estimated.

Unit root tests are statistical procedures used to test for stationarity of data. Data is stationary if the properties of the data, that is, mean and variance are time invariant and non-stationary if its mean and variance change overtime (Shrestha & Bhatta, 2018). It is important to conduct a unit root test because non stationary data gives misleading results due to presence of trend in the data series. This study applied the augmented dickey fuller (ADF) test and Philips -Perron (PP) test to check for stationarity.

The Philips-Perron test was included as it is more robust because it controls for serial correlation among error terms which the ADF test is unable to do. It also does not need lag lengths specification.

Both techniques test the null hypothesis of a unit root present and the alternate hypothesis of no unit root. We reject the null hypothesis that a unit root exists if the calculated statistics is greater than the asymptotic critical value in absolute terms (Judge, 1985).

3.4.2 Co-integration

When using time series data, variables are said to be co-integrated if they are non-stationary as individuals but when combined linearly they become stationary giving the impression that they have a relationship in the long run (Gujarati et al., 2010). The study used the Johansen (1995) cointegration equation since there were more than two variables to be estimated hence ruling out the use of Engle and Granger test. The Johansen test is used to test for presence of cointegration between series of the same order of integration. The technique uses the maximum likelihood estimation of the reduced rank model. The cointegrating rank is determined by the trace statistic and the maximum Eigen value. This criterion tests the null hypothesis of no cointegration and the alternate hypothesis that cointegration exists at a given rank. The null hypothesis of no cointegrating equations is rejected if the trace statistic is larger than the corresponding critical value.

Existence of cointegration necessitated the use of Vector Error Correction Model for analysis. The study also conducted causality analysis among the variables using Granger causality test.

Granger causality is used to establish whether a time series was useful in forecasting another (Enders, 1995).

The impulse response functions and forecasts are also presented. The IRFs help in determining whether external shocks have an impact on variables in the model and also show the response path taken by a variable in case of a shock in the system(Brooks,2002). They explain how long it will take the effect of a shock on a variable to run through the system.

3.4.3 Distribution and other diagnostic tests

Several diagnostic tests were employed on the regression residuals to check whether the VECM was correctly specified. The Langrage Multiplier (LM) test was used to test for serial correlation in the residuals, Jarque Bera test for normal distribution and the Eigen value stability test to check if the number of cointegrating equations were well specified.

CHAPTER FOUR: MODEL ESTIMATION AND ANALYSIS OF RESULTS

4.1 Data characteristics

Annual data from 1980 to 2015 was utilized in this study. Data for the variables including total public debt, capital expenditure, recurrent expenditure, foreign interest and domestic interest was collected. The basic descriptive characteristics of the data are shown in table 4.1.

Table 4.1 Descriptive statistics and correlation matrix

	VARIABLES	Mean	Median	Max	Min	1	2	3	4	5
1	Total public debt	12.49	12.67	14.77	9.75	1.0000				
2	Capital expenditure	10.35	9.79	13.80	8.17	0.8927	1.0000			
3	Recurrent expenditure	11.86	12.01	14.03	9.53	0.9858	0.9290	1.0000		
4	Foreign interest	8.48	8.65	10.41	6.77	0.8359	0.6628	0.8079	1.0000	
5	Domestic interest	9.75	10.07	11.85	6.92	0.9659	0.8361	0.9639	0.8987	1.0000

Total public debt levels were the highest among the variables estimated, while for government expenditure recurrent expenditure remained higher than capital expenditure throughout the period. This observation was supported by the means and standard deviations.

From the table above, the mean of total public debt averaged 12.49 percent with a standard deviation of 1.41. The high levels of public debt experienced between 1993 to 19994 were majorly due to increase in internally funded debt but later fell in 1995 (GoK, 1995). Recurrent expenditure had a mean of 11.86 and a standard deviation of 1.36. Recurrent expenditure was seen to be higher during years when elections were held or around those years (1992:1997:2002:

2007:2012) as compared to the other years. The years' 1992 and 1993 also had increased levels of spending in recurrent expenditure due to drought experienced in that year hence a sluggish performance in the agricultural sector but recovered in 1994 after the drought (GoK,1994).

Capital expenditure on the other hand, averaged 10.35 with a standard deviation of 1.62. Generally, the level of capital expenditure was lower in the eighties and had a significant rise between 2008 to 2013 as the government focused on development expenditure in the transport and infrastructure sector. This increase in capital expenditure was attributed to the adoption of the medium term expenditure framework which gives priority to shifting expenditure composition towards capital expenditure from recurrent expenditure.

Foreign interest averaged 8.48 with a 0.81 standard deviation while domestic interest had a mean of 9.75 and standard deviation of 1.33.

4.2 Regression results

The study used the Vector Error Correction model to carry out its analysis. This method was adopted because the variables were found to be cointegrated with tests showing presence of two cointegrating equations.

Before conducting the regression, the study conducted a number of tests to ensure that the necessary assumptions of the classical linear regression technique are fulfilled and certain properties of the variables in the study are held. The first step was to conduct unit roots.

Given the nature of the data used, it was essential to ensure that the data properties were stationary. The ADF test and Philip Perron test were used to check for stationarity. Table A1 and A2 in the appendix show the results for the ADF and PP tests respectively.

In the ADF test all variables were found to have a unit root at level but after the first difference they became stationary. This implied that the variables were integrated of order one I (1). The null hypothesis was not rejected at level because the calculated statistics were smaller than the

asymptotic critical values. However, after differencing, the null hypothesis was rejected and conclusion made that the variables were stationary.

The PP test has two test statistics; ρ(rho) and Z(t) statistics. The Z(t) statistics was used for analysis in this study. With the Philip Perron criterion, all variables were non stationary at level except recurrent expenditure which was stationary with intercept only. However, after the first difference, all variables became stationary.

Results from the two tests indicated that the variables were stationary only after they were differenced implying they moved together over the long run. A cointegration test was important to establish the cointegrating equations in the model. Since there were more than two variables in the model, the Engle Granger test was not suitable thus the study employed the Johansen cointegration test. Lag selection was conducted before performing the cointegration test. Four lags were selected using the Akaike information criterion (AIC) minimum value as shown on the results in table A3 in the appendices. Table A4 displays the Johansen cointegration test results.

The test results show that there are two cointegrating equations. The null hypothesis of no cointegration and one cointegrating equation were rejected since their trace statistics were greater than the 5% calculated critical value and accepted the alternate hypothesis of existence of two cointegrating equations at 5% critical value level.

The results of the cointegration test indicating presence of cointegration informed the decision to use the VECM for analysis. However before accepting the results of the VECM, numerous diagnostic tests were carried out. The study tested the residuals for normal distribution using the Jarque Bera test and established normal distribution in the residuals as shown in table A7 in the appendix.

The langrage multiplier test for serial correlation also found no serial correlation in the residuals as recorded in table A8 in the appendices.

The Eigen value stability test indicated that the model was stable since the real roots were less than unity and the Eigen values of the companion matrix were inside the unit circle. This

indicated the cointegrating equations were well specified. The results are presented in table A9 and figure A1 in the appendices.

4.2.1 Short run VECM results.

The short run findings on the relationship between total public debt, capital expenditure, recurrent expenditure, foreign and domestic interests are presented in table 4.2 below.

Table 4.2 Results for VECM short run model

	Total Public debt	Capital Expenditure	Recurrent Expenditure	Foreign interest	Domestic interest
First lag of TPD	0.57(0.27)	0.6(0.61)	-0.46(0.07)	0.47(0.40)	1.67(0.01)*
Second lag of TPD	-0.18(0.73)	-0.33(0.79)	-0.41(0.12)	1.19(0.04)	-0.98(0.14)
Third lag of TPD	-0.24(0.39)	-0.01(0.98)	-0.19(0.16)	0.36(0.25)	-0.74(0.03)**
First lag of CEXP	0.38(0.92)	-0.11(0.91)	0.44(0.03)**	0.79(0.09)	-1.32(0.01)*
Second lag of CEXP	-0.07(0.81)	-0.14(0.83)	0.30(0.04)**	0.81(0.01)*	-0.78(0.03)**
Third lag of CEXP	-0.14(0.29)	-0.16(0.60)	-0.24(0.72)	0.92(0.54)	-0.05(0.73)
First lag of REXP	-0.31(0.83)	1.40(0.68)	1.68(0.02)**	-2.05(0.21)	-4.89(0.01)*
Second lag of REXP	-0.95(0.42)	-0.40(0.88)	0.95(0.10)	-2.40(0.07)	-3.55(0.01)*
Third lag of REXP	-0.42(0.62)	1.35(0.50)	-0.73(0.09)	-1.74(0.07)	1.96(0.07)
First lag of INTRTF	-0.07(0.88)	-0.39(0.73)	-0.39(0.12)	-1.18(0.03)**	1.54(0.01)*

Second lag of INTRTF	0.08(0.73)	-0.01(0.85)	0.21(0.06)	-0.72(0.07)	0.55(0.06)
Third lag of INTRTF	0.01(0.90)	-0.43(0.13)	0.03(0.57)	-0.21(0.11)	0.11(0.45)
First lag of INTRTD	0.64(0.61)	0.08(0.97)	1.26(0.04)**	1.92(0.17)	-4.48(0.01)*
Second lag of INTRTD	0.10(0.92)	0.46(0.85)	-0.87(0.09)	2.67(0.02)**	-2.93 (0.02) **
Third lag of INTRTD	-0.38(0.93)	-0.03(0.97)	-0.36(0.10)	1.26(0.01)*	-0.95(0.09)
R squared	0.6992(0.01)	0.5530(0.35)	0.8710(0.00)	0.8728(0.00)	0.6953(0.01)

P values are in brackets. A single asterisk indicates a coefficient is statistically significant at 1% while a double asterisk indicates significance at 5% level of significance.

Results in table 4.2 show that the model explains 69.92% of variations in total public debt. It indicates that variations in both total public debt and capital expenditure are not influenced by any variable in the short run. However, variations in recurrent expenditure are influenced by the first and second lag of capital expenditure, its own first lag and the first lag of domestic interest. Foreign interest variations are influenced by the second lag of total public debt, second lag of capital expenditure, its own first lag and the second and third lag of domestic interest while variations in domestic interest are influenced by most of the lags of the other variable and its own lags too.

The study went on to establish causal relationship between the variables using Granger causality test. The connection between total public debt, capital expenditure, recurrent expenditure, foreign interest and domestic interest was examined. The granger causality findings are reported in table A6 in the appendices. The findings show a bidirectional flow linking debt

and recurrent expenditure, debt and foreign interest and debt and domestic interest. However, there was a unidirectional flow between public debt and capital expenditure running from capital expenditure to public debt at 1% critical value. This implied that capital expenditure granger causes public debt.

The next step was to conduct the impulse response functions. The study used the Cholesky forecast error variance decomposition (FEVD) technique and 10 steps applied. The graphs on the impulse response functions are presented in figure A2 to A6. The graphs show that total public debt responds negatively to shocks in capital expenditure and foreign interest and positively to shocks on itself, recurrent expenditure and domestic interest. Table A6 in the appendices shows a detailed interpretation of the FEVD results.

The table shows that in the first two years' innovations in the other variables have a neutral effect on variations in public debt. However, from year 3 variance in public debt is responsive to innovations in the variables. Innovations in capital expenditure explain 3% of variances in total public debt in the third year and by the 10th year it explains 5% of the variances in public debt. Innovations in recurrent expenditure, however, explain less than 1% of variations in public debt by the end of the ten-year period.

Results of the dynamic forecasts are presented in figure A7 in the appendices. The forecasts show that the variables continue to increase over time. The width of the confidence intervals increased with the forecast period.

4.2.2 The long run VECM estimation results

Table 4.3 below presents findings for the long run estimation.

Table 4.3 Long run VECM results

Dependent var: TPD

Method: VECM

Included observations:32

Variable	Coefficient	Std error	T statistics	P values
Total public debt	1	-	-	-
Capital expenditure	0.8369639	0.0880447	9.51	0.000
Recurrent expenditure	-3.388713	0.2752526	-12.31	0.000
Foreign interest	-1.37254	0.2002652	-6.85	0.000
Domestic interest	2.214733	0.2916683	7.59	0.000
__Cons	9.380555	-	-	-

Source: Author's calculations

The findings indicate that the coefficients of all the variables were statistically significant at 1% significance level. Recurrent expenditure and foreign interest impacted total public debt positively while capital expenditure and domestic interest have negative impact on total public debt.

4.2.2 The relationship between public debt and capital expenditure

In the short run public debt and capital expenditure have an insignificant relationship as the coefficients of all three lags of capital expenditure are not significant at both 1% and 5% significant levels. This can be explained by the fact that most development projects and programmes take longer to be executed to completion thus their effects are not felt in the first few years.

However, capital spending has a significant inverse correlation with public debt over time. With a -0.8369639 coefficient and t-statistic of -9.5, capital expenditure has a strongly negative impact on public debt in the long run. A unit increase in capital spending results to a decrease in public debt by 84%. This is in line with the theory of allocative efficiency which advocates for allocation of funds to projects that yield the highest social benefit to the society and are productive in the long run. This finding however differs from that of Uguru (2016) who found capital spending to have a positive significant relationship with public debt in Nigeria.

The granger causality results also indicate a unidirectional flow between public debt running from capital expenditure to public debt. This further confirms that the choice of projects by the government have an effect on the debt levels. If the government spends on income generating projects, the level of debt is bound to decrease in the long run while if it spends in projects that resource-wasting, the levels of public debt will continue rising. This is because efficient allocation of resources for capital expenditure on the right projects lead to capital accumulation and income creation that can be used to service the debt reducing the need to continue borrowing heavily thus enabling the government to maintain a sustainable level of debt.

4.2.3 The relationship between public debt and recurrent expenditure

In the short run, public debt and recurrent expenditure also have an insignificant relationship. However, in the long run there is a significant positive correlation between recurrent expenditure and public debt. Recurrent expenditure had a coefficient of 3.388713, p-value of 0.000 and a t-statistic of 12.31. This showed that recurrent expenditure had a greater impact on public debt in

the long term and these findings were in line with the findings of Uguru (2016). An increase in the level of recurrent spending will contribute to higher levels of public debt in the distant future.

The granger causality results show a bidirectional flow in public debt and recurrent expenditure. This confirms that the government of Kenya borrows to finance its budget deficit and spends it heavily on recurrent expenditure. The level of debt is therefore affected by the level of recurrent expenditure since recurrent expenditure granger causes public debt. The results are also in line with Keynesian postulations that increase in public debt causes a rise in government spending.

The second objective of the study was to investigate how public debt responds to changes in capital expenditure and recurrent expenditure. The findings are presented below.

4.2.4 Response of public debt to changes in capital expenditure, recurrent expenditure and itself

Total debt responds negatively to changes in capital expenditure. From the IRF graph, there is a sharp decline in public debt in the first two years before the shock is neutralized but the effect remains in the negative range. This implied that capital expenditure has a impacted negatively on total public debt.

A shock in recurrent expenditure leads a sharp rise in the level of debt in the first two years followed by a sharp decrease in third year but the decrease remains in the positive range before it stabilizes in the fifth year towards the negative range. This suggests a mixed effect on total public debt and can be explained by how allocation of recurrent expenditure is done. If allocation is done on productive areas, the effect may be negative and if done on non-productive areas the effect may be positive (Lerner,1948).There is a stable response of total debt on its own shock. Public debt has a positive response to its own shock in the first four years before it is stabilized in the fifth year but remains in the positive range.

CHAPTER FIVE: CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Summary

This study sought to understand the relationship between public debt, capital expenditure and recurrent expenditure and investigate how public debt responds to changes in capital expenditure and recurrent expenditure. Understanding this relationship would be important in fiscal policy formulation and most importantly public debt management.

For these objectives to be achieved, data on public debt, capital expenditure and recurrent expenditure was collected for the period 1980-2015 from various Economic Surveys and Annual Public Debt Reports.

Stationarity tests were conducted to determine the order of integration of the series. ADF and Philip Peron tests were used and the study found out that all the series in the study were integrated of order one thus implying long run relationship. The study further conducted a cointegration test using the Johansen cointegration test and established that there were two cointegrating equations.

The study applied VECM to estimate the regression equation. Diagnostic tests such as VECM stability test, LM test for autocorrelation and the Jarque Bera test for normality of residuals were then applied to test for model significance. The IRFs and Cholesky FEVD were also evaluated.

5.2 Conclusions

The major objective of the study was to establish the impact of capital and recurrent expenditure on public debt. It concluded that, based on its findings, both capital expenditure and recurrent expenditure had significant effects on public debt. However, the effect of recurrent spending on public debt was greater.

The first specific objective was to establish the relationship between public debt, capital expenditure and recurrent expenditure. The main interest was to establish whether the Government of Kenya spends on the productive or non-productive sectors in the economy. The

study found that capital expenditure was negatively correlated to public debt while recurrent expenditure was positively correlated to public debt. It also established that the government spending on recurrent expenditure exerts greater effect on public debt as compared to its spending on capital expenditure. Innovations in capital expenditure would contribute to a significant movement of public debt to sustainable levels.

The second objective was to investigate how public debt responds to changes in capital expenditure and recurrent expenditure. The study further established that public debt responded negatively to shocks in capital expenditure and positively to shocks in recurrent expenditure and its own shocks. Shocks on foreign interest also had an inverse effect on variances in public debt while shocks on domestic interest impacted positively on total debt. In the short run, there is both a positive and negative response by debt to changes in recurrent expenditure. Evidence of this mixed reaction indicates that there may be possible improvement in public debt reduction if spending in recurrent expenditure is done efficiently by channeling and reallocating resources to more productive activities.

The bidirectional causality linking recurrent expenditure and public debt confirms that the government actually borrows with the intention to spend on non -productive activities while the unidirectional flow of causality from capital expenditure to public debt implies that spending on capital expenditure affects the debt level but the level of debt does not necessarily influence spending on capital expenditure. This means that the government of Kenya borrows heavily to finance its recurrent expenditure as opposed to spending on the productive sector.

This study therefore concludes that the problem of soaring public debt levels is more of a management problem and can be solved through efficient allocation of resources in expenditures.

5.3 Policy implications

To ensure sustainable levels of debt, the government should increase its spending on capital expenditure. This should be channeled in form of development expenditure to sectors that have greater impact to the welfare of the people such as investment in agriculture, education and health. This is supported by results that indicate there is a significant negative correlation between public debt and capital expenditure where a unit rise in capital expenditure causes a

reduction in public debt by around 84% in the long run. Investment in capital expenditure leads to capital formation and income generation that can be channeled to debt repayment thereby reducing the burden of debt servicing and the need to further borrow to repay previous loans.

Efficiency in allocation of resources especially in recurrent spending should also be emphasized in the government to ensure projects and programmes that yield the highest social benefits are prioritized. Reallocation of resources from expenditure that is wasteful such as continued increase in civil servants' wages, salaries and allowances to more productive recurrent expenditure can go a long way in reducing the debt burden. In view of the findings, recurrent expenditure was found to exert greater effect on public debt. However, there was a mixed response, both positive and negative by public debt to changes in recurrent expenditure implying that if managed well, recurrent expenditure can contribute to reducing the debt level.

The government should also increase its revenue collection by sealing loopholes such as tax evasion in order to reduce the need to borrow heavily to finance its budget deficit.

The study therefore recommends that the Government of Kenya needs to increase its capital expenditure and ensure efficient allocation of resources even when spending on recurrent expenditure.

5.4 Areas for further research

The major limitation encountered in this study was the lack of relevant literature in the topic. This was because there had been no study conducted in Kenya to linking the interaction of public debt and capital and recurrent expenditure. The study therefore relied on studies that were close to the subject.

Secondly, since different econometric techniques give different results. This study applied VECM in its analysis. Future studies should investigate this relationship using other econometric techniques and compare results.

Finally, the focus of this study was limited to the relationship between public debt, capital expenditure and recurrent expenditure and the response of public debt to changes in capital expenditure and recurrent expenditure in general. The study proposes further research on how public debt interacts with the individual components of capital and recurrent expenditure such as education, economic affairs, health and defense in order to establish how the specific composition of expenditure impacts public debt.

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APPENDICES

Table A1: Augmented dickey fuller test results.

Variable	Form of test	Test statistic (at level)	Conclusion	Test statistic (at 1st difference)	Conclusion
Total public debt	Intercept	-1.28	Non-stationary	-4.3	Stationary
	Trend and intercept	-2.27		-4.28	
Capital expenditure	Intercept only	0.74	Non-stationary	-7.47	Stationary
	Trend and intercept	-1.83		-8.06	
Recurrent expenditure	Intercept only	0.69	Non-stationary	-5.09	Stationary
	Trend and intercept	-1.86		-5.02	
Foreign interest	Intercept only	-1.01	Non-stationary	-5.69	Stationary
	Trend and intercept	-1.78		-5.58	
Domestic interest	Intercept only	-1.67	Non-stationary	-7.22	Stationary
	Trend and intercept	-2.03		-7.33	

Source: Author's calculations

ADF asymptotic critical values at level

With intercept only

	Test statistic
Test critical value 1% level	-3.682
5% level	-2.972
10% level	-2.618

With trend and intercept

	Test statistic
Test critical value 1% level	-4.288
5% level	-3.560
10% level	-3.216

ADF asymptotic critical values at 1st difference

With intercept only

	Test statistic
Test critical value 1% level	-3.689
5% level	-2.975
10% level	-2.619

With trend and intercept

Test statistic

Test critical value 1% level   -4.297

5% level   -3.564

10% level   -3.218

Table A2: Philip Peron test results

Variable	Form of test	Test statistic (at level)	Conclusion	Test statistic (at 1st difference)	Conclusion
Total public debt	Intercept	-1.243	Non-stationary	-4.217	Stationary
	Trend and intercept	-2.397		-4.191	
Capital expenditure	Intercept only	1.589	Non-stationary	-7.550	Stationary
	Trend and intercept	-1.531		-8.784	
Recurrent expenditure	Intercept only	10.439	Stationary	-5.069	Stationary
	Trend and intercept	-2.036	Non stationary	-4.968	
Foreign	Intercept only	-0.895	Non-stationary	-5.679	Stationary

interest					
	Trend and intercept	-1.777		-5.557	
Domestic interest	Intercept only	-1.749	Non-stationary	-7.055	Stationary
	Trend and intercept	-2.014		-7.163	

Source: Author's calculations

PP asymptotic critical values at level

With intercept only

Test statistic

Test critical value 1% level   -3.682

5% level   -2.972

10% level   -2.618

With trend and intercept

Test statistic

Test critical value 1% level   -4.288

5% level   -3.560

10% level   -3.216

PP asymptotic critical values at 1ˢᵗ difference

With intercept only

$$\text{Test statistic}$$

Test critical value 1% level	-3.689
5% level	-2.975
10% level	-2.619

With trend and intercept

$$\text{Test statistic}$$

Test critical value 1% level	-4.297
5% level	-3.564
10% level	-3.218

Table A3: Lag selection

Selection-order criteria

Sample: 1985 - 2015   Number of obs = 31

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	27.4085				1.6e-07	-1.445	-1.370*	1.214*
1	48.4843	42.152	25	0.017	2.1e-07	-1.192	-.740	1 .195
2	74.9846	53.001	25	0.001	2.2e-07	-1.289	-.459	1.254

3	106.117	62.266	25	0.000	2.2e-07	-1.685	-.478	2.015
4	137.785	63.335*	25	0.000	3.6e-07	-2.115*	-.532	2.741

Table A4: Johansen cointegration test results

Trend: constant.					No of obs=31		
Sample:1985-2015					lags=4		
Max rank	Parms	Eigen value	Trace statistic	5% critical value	Max statistic	5% critical value
0	80	-	91.06	68.52	36.07	33.46
1	89	0.687	54.99	47.21	28.06	27.07
2	96	0.59	26.93*	29.68	20.85	20.97
3	101	0.48	6.08	15.41	3.75	14.07
4	104	0.11	2.33	3.76	2.33	3.76
5	105	0.72				

Source: Author's calculations

Table A5: Granger Causality-Wald test results

Equation	Excluded	Chi2	df	Prob > chi2
TPD	CEXP	12.816	4	0.012
	REXP	11.02	4	0.026
	INTRTF	10.764	4	0.029
	INTRTD	14.353	4	0.006
	ALL	47.154	16	0.000
CEXP	TPD	4.239	4	0.375
	REXP	4.118	4	0.390
	INTRTF	3.389	4	0.495
	INTRTD	2.506	4	0.644
	ALL	52.263	16	0.000
REXP	TPD	34.04	4	0.000
	CEXP	11.085	4	0.026
	INTRTF	12.259	4	0.016
	INTRTD	27.452	4	0.000
	ALL	72.644	16	0.000

INTRTF	**TPD**	41.747	4	0.000
	CEXP	50.455	4	0.000
	REXP	46.216	4	0.000
	INTRTD	121.57	4	0.000
	ALL	230.97	16	0.000
INTRTD	**TPD**	18.393	4	0.001
	CEXP	19.177	4	0.001
	REXP	9.771	4	0.044
	INTRTF	9.545	4	0.049
	ALL	65.321	16	0.000

Table A6: Results for forecast error variance decomposition (FEVD)

Step	Impulse=CEXP Response=TPD	Imp=REXP Resp=TPD	Imp=INTRTF Resp=TPD	Imp=INTRTD Resp=TPD
0	0	0	0	0
1	0	0	0	0
2	0.03839	0.000743	0.000685	0.008086

3	0.0443	0.000533	0.001741	0.015425
4	0.046958	0.000526	0.002974	0.021338
5	0.048474	0.000561	0.003905	0.025275
6	0.049491	0.000608	0.004074	0.028066
7	0.050174	0.000647	0.005045	0.030022
8	0.050672	0.000679	0.005402	0.031486
9	0.051044	0.000704	0.005675	0.032598
10	0.051334	0.000725	0.005889	0.033469

Table A7: Jarque -Bera test

Equation	chi2	df	Prob > chi2
D_TPD1	0.756	2	0.68529
D_CEXP1	1.010	2	0.60344
D_REXP1	0.731	2	0.69383
D_INTRTF1	2.753	2	0.25252
D_INTRTD1	0.624	2	0.73207
ALL	5.873	10	0.82578

Table A8: Langrage multiplier

Lags	Chi2	df	Prob > chi2
1	20.3399	25	0.72878
2	18.6841	25	0.81201

H0: no autocorrelation at lag order

Table A9: Eigenvalue stability condition

Eigenvalue	Modulus
1	1
1	1
1	1
1	1
-.6950113 + .5175106i	.866521
-.6950113 - .5175106i	.866521
-.3867042 + .7684094i	.860229
-.3867042 - .7684094i	.860229
.4572219 + .7148036i	.848526
.4572219 - .7148036i	.848526
-.791411 + .04891198i	.792921

-.791411 - .04891198i	.792921
.7620041	.762004
.04471072 + .7424625i	.743808
.04471072 - .7424625i	.743808
.5676019 + .4194815i	.705788
.5676019 - .4194815i	.705788
.2862394 + .554237i	.623788
.2862394 - .554237i	.623788
-.2637718	.263772

The VECM specification imposes 4 unit moduli

Source: Author's calculations

Figure A1: Eigen value stability circle

Roots of the companion matrix

The VECM specification imposes 4 unit moduli
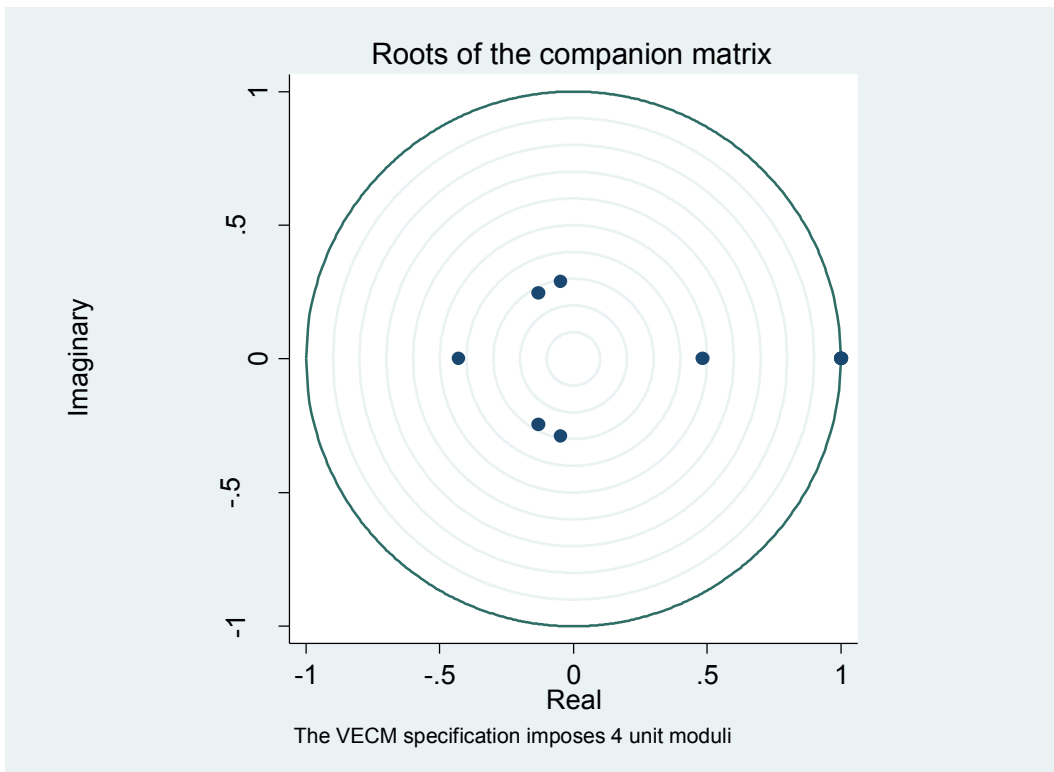
FigureA2: Response of total public debt to changes in capital expenditure

Graphs by irfname, impulse variable, and response variable
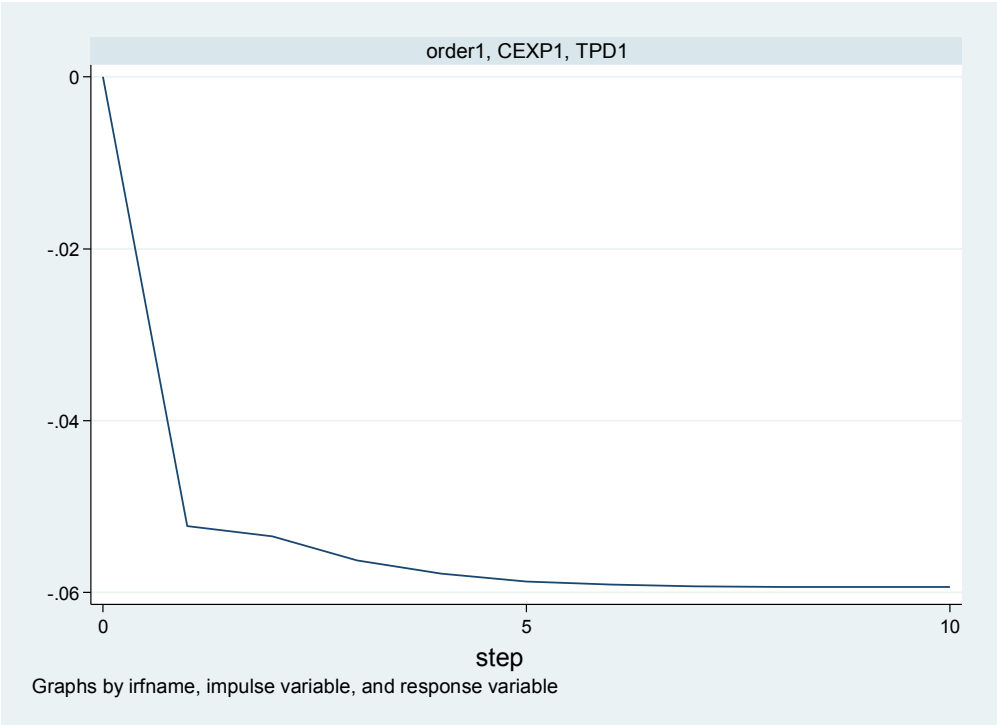
Figure A3: Response of total public debt to changes in recurrent expenditure

order1, REXP1, TPD1

Graphs by irfname, impulse variable, and response variable
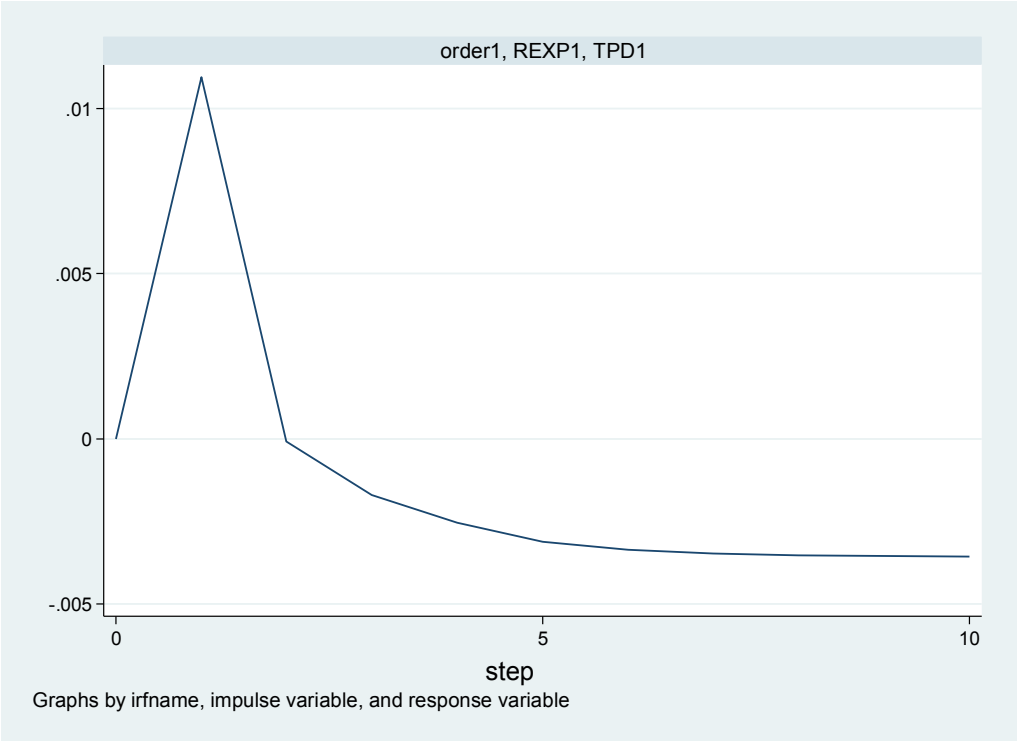
FigureA4: Response of total public debt to its own shocks

order1, TPD1, TPD1

step

Graphs by irfname, impulse variable, and response variable
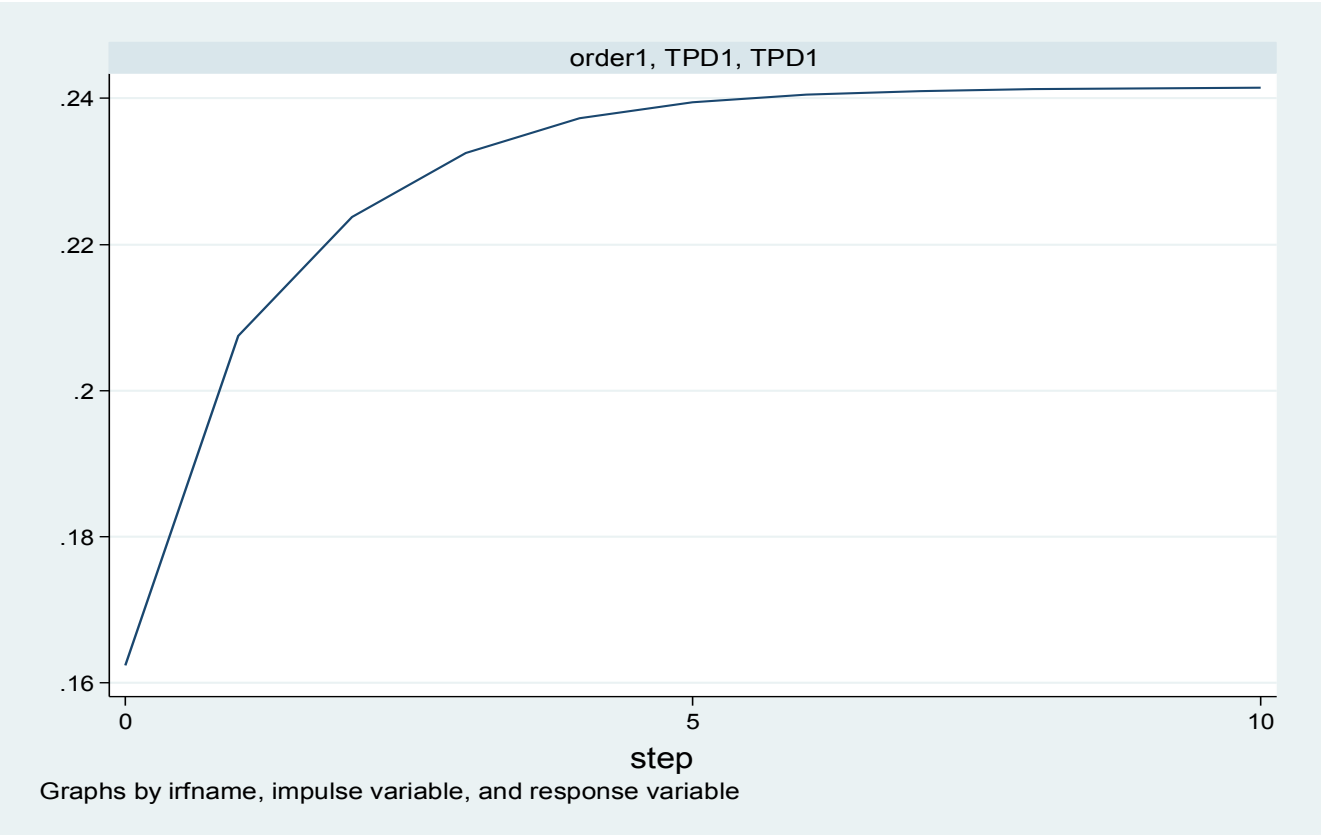
Figure A5: Response of total public debt to changes in domestic interest

order1, INTRTD1, TPD1

step

Graphs by irfname, impulse variable, and response variable
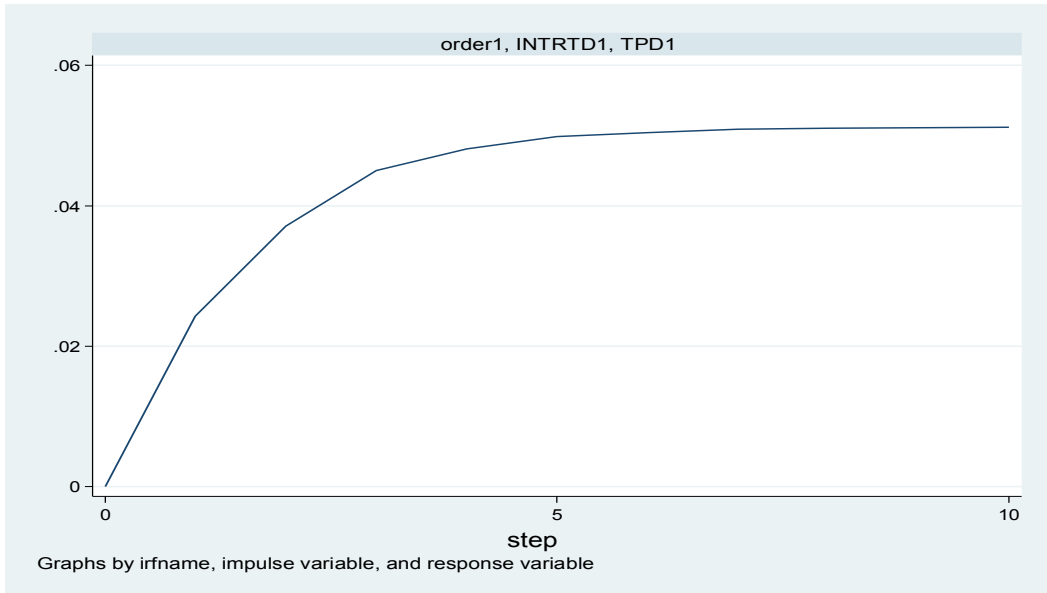
FigureA6:Response of total public debt to changes in foreign interest


order1, INTRTF1, TPD1

step

Graphs by irfname, impulse variable, and response variable
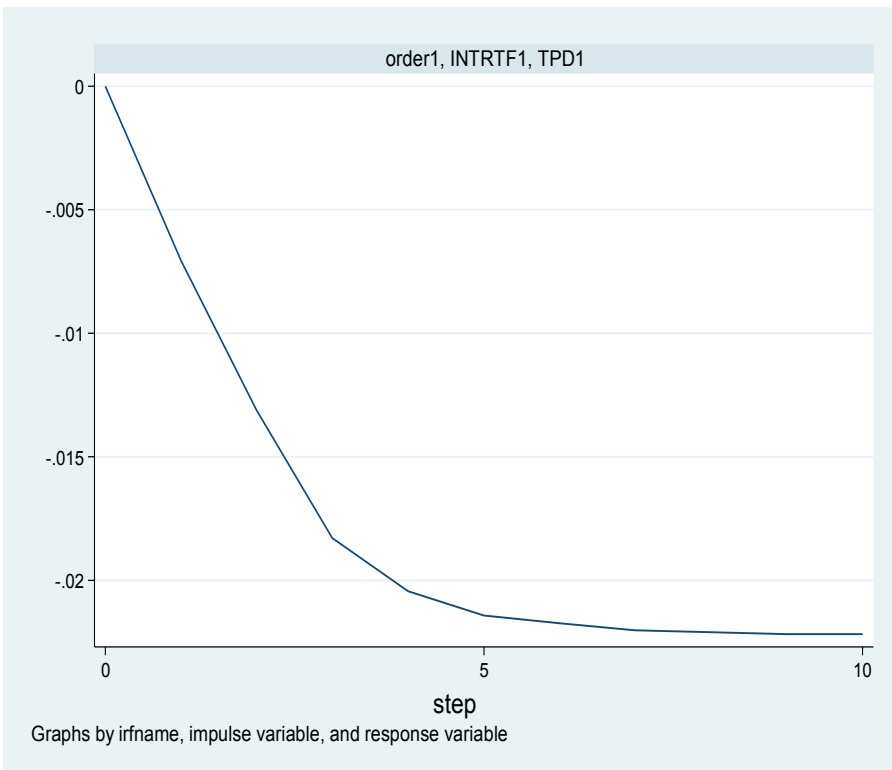
FigureA7: Dynamic forecasts

Forecast for INTRTD1

Forecast for INTRTF1

Forecast for REXP1

Forecast for CEXP1

Forecast for TPD1

95% CI ——— forecast