

**NEXUS BETWEEN PUBLIC SECTOR EXPENDITURE AND PUBLIC DEBT IN
KENYA**

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UNIVERSITY OF NAIROBI

DECLARATION

This research paper being my original work has not been presented for award of a degree in any University.

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As the University supervisor, I approve submission of this research paper for examination.

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DEDICATION

This research paper is dedicated to my beloved parents, spouse and three sons.

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ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike's Information Criteria
ARDL	Auto Regressive Distributed Lag
BG	Breusch Godfrey
BOP	Balance of Payment
BPS	Budget Policy Statement
CAB	Current Account Balance
CBK	Central Bank of Kenya
DF	Dickey Fuller
ECM	Error Correction Model
FPE	Final Prediction Error
GDP	Gross Domestic Product
HQIC	Hannan-Quinn Information Criterion
IMF	International Monetary Fund
ISB	International Sovereign Bond
KAB	Capital Account Balance
MDGs	Millennium Development Goals
MTDMS	Medium Term Debt Management Strategy
MTEF	Medium Term Expenditure Framework
MTP	Medium Term Plan
OLS	Ordinary Least Square Method
PP	Philip Perron
SAPs	Structural Adjustment Programmes
SBIC	Schwarz's Bayesian Information Criterion

VARSOC	Vector Auto Regressive Specification Order Criterion
VECM	Vector Error Correction Model
ZA	Zivot and Andrews

ABSTRACT

Public debt being an important source for bridging financial resource gap, continues to be a key macro-economic policy issue for developing countries. Existing literature highlights public expenditure as a public debt determinant. Establishing nexus between public expenditure and public debt in Kenya for the period 1980 to 2018 was the object of the study. This included determining causality direction and type of relationship existing between the aforementioned variables. Empirical analysis was based on a Vector Error Correction Model. Recurrent government expenditure negatively affect public debt whereas development government expenditure and inflation have a positive effect on public debt. Public debt did not exhibit an equilibrium relationship with either recurrent or development government expenditure in the long-run.

Election years and bicameral government have a positive effect on public debt whereas exchange rate has a negative effect on public debt in the long run. Causality between public debt and development government expenditure is bidirectional whereas causality between recurrent government expenditure and public debt is unidirectional running from public debt to recurrent government expenditure. Similarly, causality between recurrent government expenditure and development government expenditure is unidirectional running from recurrent government expenditure to development government expenditure. To manage public debt the government should strive to reduce development expenditure to sustainable levels, focus on productive development and reduce its appetite for expensive loans. Also the revenue base should be expanded so that the debt burden does not deem the prospects of the national, regional and international development agenda.

CHAPTER ONE: INTRODUCTION

1.1 Background

Public debt being an important source for bridging financial resource gap, continues to be a key macro-economic policy issue for developing countries (Adepoju et al., 2007 and Mwangi, 2009). Specifically, public debt if utilized productively leads to increased resource availability and production capacity, accelerated economic growth, enhanced development, and; deepening and regulation of domestic financial markets (Siddiqui, 2002; Tiruneh, 2004; and Abbas & Christensen, 2007). Nevertheless, public debt also has another less desirable face. Overreliance on debt can lead to increased macroeconomic risks, negative economic growth, unbalanced budgets and spending (Alesina & Tabellini, 1990; Mahdavi, 2004; Audu, 2004; Chongo, 2013; and Ukwueze, 2015). Debt financing through domestic borrowing contributes to increased interest rates thereby crowding out local players and stifles investments. In addition, high levels of domestic debt induce uncertainties and thus force the government to impose higher tax burden (Abbas & Christensen, 2007; King'wara, 2014 and Osoro, 2016). Similarly external public debt encourages capital flight, reduces domestic investments and savings. This therefore results in reduced tax base and ultimately affects servicing of debt (Alberto & Tabellini, 1989 and Wijiweera et al., 2005).

Public expenditure's contribution to fiscal deficit brings about the connection between public expenditure and debt. Theoretical arguments suggest that huge fiscal deficits results into increased borrowings by the Government (Chongo, 2013). Fiscal deficits arise when the government expenditure is higher than revenue capacity. Government expenditure is ever growing without necessarily a corresponding growth in revenue for most developing countries (Osoro, 2016). The rise in public expenditure was witnessed during the 1914-18 and 1939-45 wars, where the share of public spending to GDP rose to over 45% in Britain and 60% across other Nations (Kiminyei, 2014). In order to finance high expenditure programs necessary for a country's productivity, governments resort to domestic borrowing, external borrowing and printing more currency so as to increase money supply (Kiminyei, 2014 and Osoro, 2016).

In view of the above, both public debt and public expenditure play a substantial part in developing nations. Debt sustainability is important and features in the 2030 agendas, it is therefore critical to contribute to the available existing knowledge on public expenditure and debt in Kenya. Patrizio (2011) argues that economic growth requires total debt growth and that achieving economic growth and total debt reduction simultaneously is almost impossible. By particularly examining the relationship between aforementioned variables for the period 1980 to 2018, the study is expected to inform policy makers the desired mix that is necessary for sustainable economic growth and development.

1.2 Expenditure versus Revenue in Africa

The greatest challenge for African countries is currently the means to finance infrastructure development projects geared towards boosting economic growth and improving living standards. This is because there has been a decline in concessional financing occasioned by tight budget constraints experienced in major donor countries. An evaluation of the African economies by Africa Development Bank for the period 2008 to 2015 shows that proportionate growth of government revenue has been horizontal whereas the proportion of expenditure has been expanding. This therefore means that African governments have resorted to deficit financing through borrowing as a viable option. The greatest concern is that some countries have turned to borrowing from the international capital markets resulting in rising debt levels that may eventually burden the respective economies (African Economic Outlook, 2018).

Overall tax to GDP ratio is low in most African countries, there is a sharp decline in external official development assistance (attributed to the financing and economic crisis of 2008/09) and thus necessitating increased demand for external finances. In as much as development financing is critical to meet the priorities envisaged in Africa's blue print, the level of debt ought to be compatible with the country's need and capacity to service loans. This compatibility will cushion the African countries against the debt burden that may in turn interfere with future growth prospects (African Economic Outlook, 2018).

Table 1 shows the public revenue to GDP and public expenditure to GDP for selected African countries.

Table 1: Revenue versus Expenditure as a proportion of GDP for selected African countries

Country	Variable	2010	2011	2012	2013	2014	2015	2016	2017
Egypt	Revenue % of GDP	21.6	19.3	19.3	20.0	21.7	22.0	21.5	21.3
	Expenditure % of GDP	29.4	29.3	29.9	33.7	33.9	33.4	32.7	30.9
Ghana	Revenue % of GDP	19.2	21.7	22.8	20.5	21.8	23.4	20.1	20.0
	Expenditure % of GDP	26.6	25.6	28.6	28.9	28.1	29.2	29.1	26.7
Kenya	Revenue % of GDP	23.1	24.7	25.7	19.0	19.6	19.6	18.2	18.3
	Expenditure % of GDP	29.5	29.2	31.7	25.9	25.3	28.1	26.4	27.5
Rwanda	Revenue % of GDP	25.6	24.3	25.7	23.2	26.0	25.3	25.0	23.6
	Expenditure % of GDP	25.7	26.7	26.9	28.5	30.0	30.6	28.5	28.4
South Africa	Revenue % of GDP	27.5	28.2	27.8	27.9	28.6	29.5	29.2	28.8
	Expenditure % of GDP	31.6	32.1	32.0	31.7	32.2	33.1	32.7	33.1
Tanzania	Revenue % of GDP	20.5	20.6	21.6	15.3	15.7	14.6	15.4	15.9
	Expenditure % of GDP	27.5	27.0	26.2	20.1	19.1	17.9	19.1	17.3
Uganda	Revenue % of GDP	15.7	18.7	15.6	12.9	12.6	14.1	14.3	15.6
	Expenditure % of GDP	19.8	23.0	18.6	16.5	16.6	18.2	18.4	18.9

Source: Africa Statistical Year Books, Africa Development Bank

Table 1 illustrates that the expenditure ratio is higher than that of revenue in all selected seven countries in Africa (including Kenya) for the period 2010 to 2017. This implies that all these countries have resorted to deficit financing so as to bridge their respective resource gaps.

1.3 Public Expenditure in Kenya

Public expenditure is government spending in order to provide common needs of a country (Odo et al., 2016). Public expenditure is classified into recurrent and development. Recurrent government expenditure constitutes spending on goods and services provided on regular basis such as salaries and wages, transfer of payment and interest on debt; development expenditure on

the other hand constitutes spending on infrastructure such as new motorways, roads, hospitals, schools and prisons (Ndonga, 2014 and Kiminyei, 2014).

To stimulate economic performance, the Government of Kenya has adopted public expenditure as a key fiscal parameter. The country's development blue print aims to propel annual economic growth rate to a double digit. The government of Kenya, through the Medium Term Plan III (2018-2022) of the Vision 2030, has prioritized food and nutrition, universal healthcare, affordable housing, and manufacturing known as the "Big Four" Initiatives. The aspirations of the Kenya's development agenda resonate well with those of the 2030 Agenda for sustainable development and Africa Agenda 2063.

Implementation of the programmes under the national, continental and international development frameworks, requires both domestic and external financial investments. Similarly implementation of the Constitution of Kenya and in particular devolved structures requires colossal public expenditures as reflected in the country's financial year (FY) 2013/14 to 2017/18 annual budgets and expenditure reports. For instance, public expenditure increased from Kshs. 1.53 trillion in the FY 2013/14 to Kshs. 1.93 trillion in FY 2014/15 and Kshs. 2.03 trillion in FY 2015/16. This translates into an increase of 26% and 33% in FY 2014/15 and 2015/16 respectively (Economic survey, various issues). In the financial year 2017/18 public expenditure was Kshs. 2.778 trillion translating to an increase of 21.7% from the actual expenditure of Kshs.2.1072 trillion in the FY 2016/17. Out of the 2017/18 total expenditure, recurrent expenditure was Kshs.2.1072 trillion constituting 75.9% while development expenditure was Kshs.670.6 billion constituting to 24.1% (Kenya National Bureau of Statistics, 2018).

1.4 Public Debt in Kenya

Public borrowing in Kenya is under an institutional and policy framework consisting of the Kenya External Resources Policy (2014) and the Medium Term Debt Management Strategy (MTDS) implemented by the National Treasury (The National Treasury, 2016). The External Resources Policy provides a framework for engagement in sourcing and managing resources required by government, for investments needed to realize the country's development agenda (Republic of Kenya, 2014).

Evolution of external debts can be traced back to 1973 during the oil crisis which destabilized balance of payment (BOP) and the second oil crisis coupled with the 1979/80 drought. The Government of Kenya thus resorted to external borrowing in order to handle the BOP crisis and the drought. In addition, high government spending, unfair trade policies and slow rise in revenue widened the public sector deficits and hence more borrowing was needed to maintain expenditure levels (Were, 2001). External debt accumulated was Kshs 9.95 billion in 1980; Kshs 68.38 billion in 1990, Kshs 362.50 billion in 2000, Kshs 548.68 billion in 2010, and Kshs 2,294.15 billion in 2017 (Economic survey, various issues). This is a clear indication that external borrowing has increased by almost 3,400% within the last three decades.

Domestic borrowing consists of Treasury Bills, short and long term treasury bonds, overdrafts from Central Bank and Commercial Bank advances. Domestic public debt therefore refers to debt incurred after the State borrows internally from its citizens (Maana et al., 2008). Reinhart & Rogoff (2008) carried out a study on 64 selected countries which included the periods before 1900. Their observation was that domestic debt accounted for 67% of total public debt hence domestic public debt is not unique for countries that are developing.

Borrowing by the National Treasury from the domestic market is anchored on a legal framework, the Internal Loans Act (Cap 420) of 2009. An annual target for domestic borrowing is normally set by the Government through the budget. The figure can however be revised through a supplementary budget. Further, to offset fluctuations in the payments against receipts from the budgeted revenue, the government is allowed to access overdrafts from the Central Bank within the provisions of the Central Bank of Kenya Act 2014. The Act places the upper ceiling of such overdrafts to five percent of the most recent audited ordinary revenue (Maana et al., 2008).

Domestic debt on a large scale can be traced back to the 1990s following the decline in foreign direct assistance. The decline in foreign aid was a result of negative donor perception on public resources management in Kenya. This decline resulted into a gap in financial resources which led the government to borrow more internally eventually leading into a rise in Kenya's debt. The crisis was aggravated by the scandals like Goldenberg that fleeced the country billions of shillings hence reduced donor inflows. To finance its expenditure, the Kenya turned to expensive

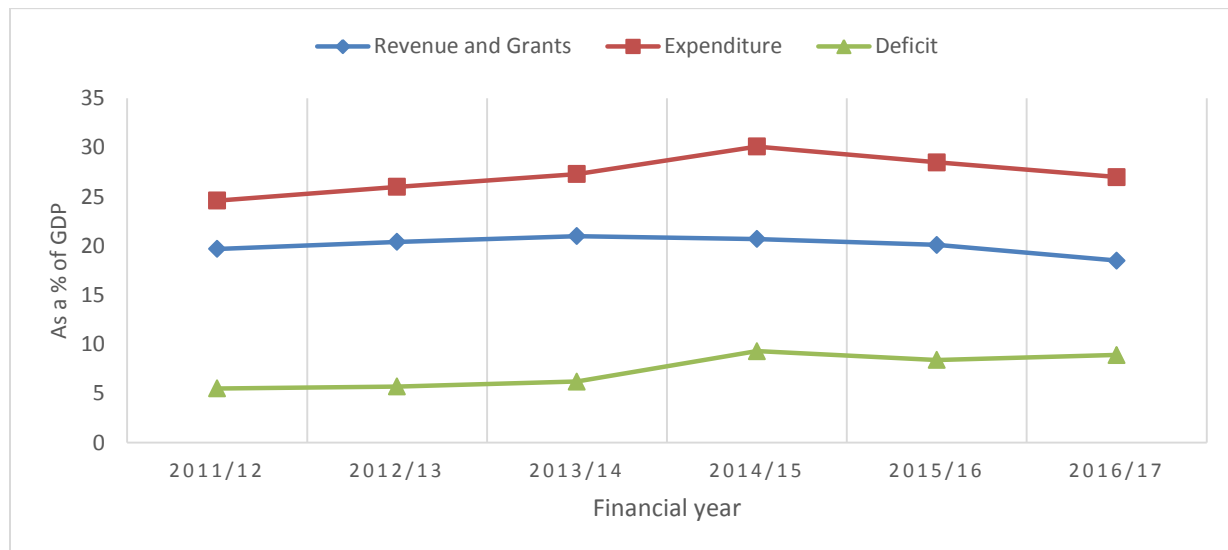
domestic borrowing (Putunoi & Mutuku, 2013). Domestic public debt accumulated was Kshs. 7.14 billion in 1980, Kshs. 26.78 billion in 1990, Kshs. 206.06 billion in 2000, Kshs. 533.97 billion in 2010 and Kshs. 1,677.24 billion in 2017 (Economic survey, various issues). The domestic public debt has rapidly increased in the last three decades. For instance, it more than doubled from 2000 to 2010 and increased almost three-fold from 2010 to 2017.

The Annual Public Debt Report 2017-18 reveals that the outstanding public debt was Kshs. 5,047,234 and Kshs. 4,406,863 million in June 2018 and 2017 respectively. Domestic debt increased from Kshs. 2,112,710 million in June 2017 to Kshs 2,478,835 million in June 2018 while external debt increased from Kshs. 2,294,153 million to Kshs. 2,568,398 million in the same periods respectively. Increased external debt is attributed to International Sovereign Bond (ISB) of Kshs. 200 billion borrowed in FY 2017/18. The public debt service payment total in June 2018 was Kshs. 459.455 billion compared to Kshs. 308. 488 billion in June 2017. Proportion of debt service to government revenue increased from 23.6% in June 2017 to 33.8% in June 2018. The increase in proportion is attributed to repayments on high stock of external commercial debts that matured in FY 2017/18 (The National Treasury, 2018).

1.5 Trends in Public Sector Expenditure and Debt

Figure 1 presents the recent trends in revenue, expenditure and deficit as percentage of Gross Domestic Product in Kenya. It is curious to note that the pattern displayed in figure 1 below is consistent with the African Development Bank's (2018) evaluation on African economies whereby government revenue (including grants) is almost constant, expenditure is increasing and the deficit is widening. The sharp increase in expenditure in 2014/15 is attributed to the standard gauge railway project amongst other prioritized infrastructural projects by the government.

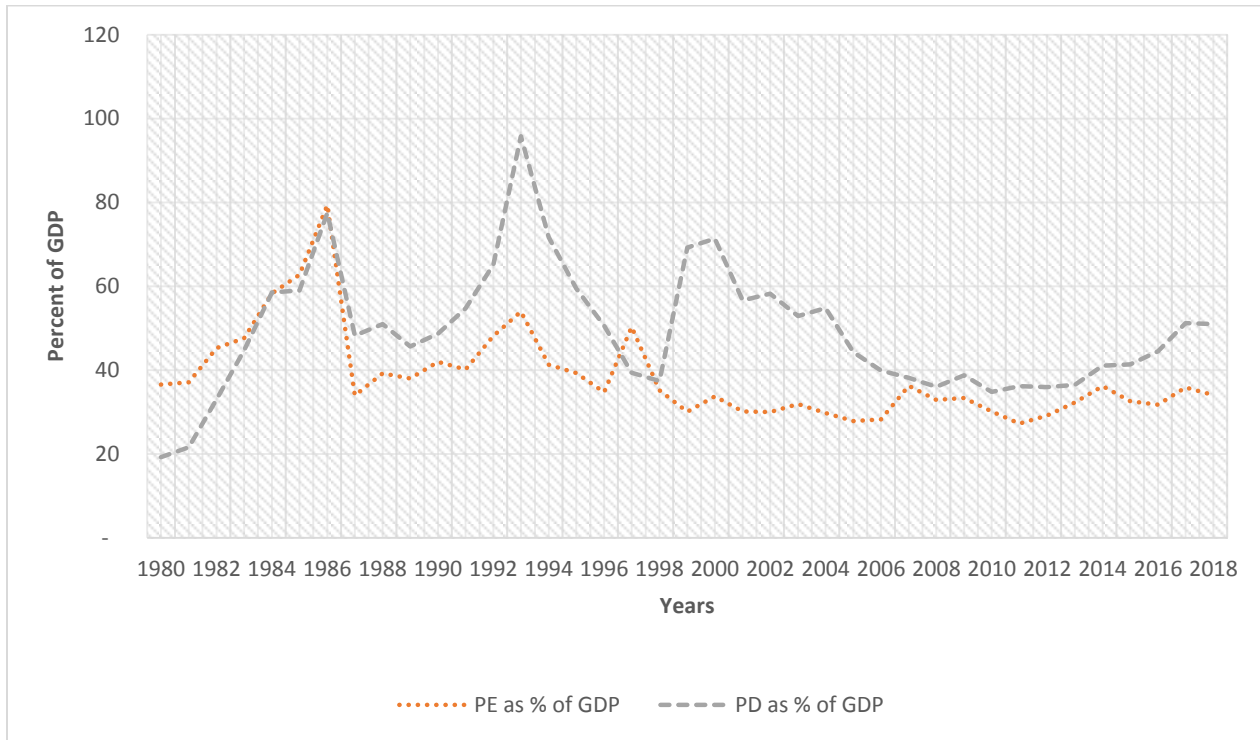
Figure 1: Revenue and Grants, Expenditure and Deficit



Source: Central Bank of Kenya

Figure 2 on the other hand presents trends in Kenya's public sector expenditure and debt as percentage of GDP from 1980 to 2018. Public expenditure constitutes both recurrent and development expenditures whereas public debt constitutes both external and domestic debts. Following the trends in Kenya in past thirty eight (38) years as depicted in the figure 2, both public debt (PD) and public expenditure (PE) have had mixed growth patterns. Public expenditure was greater than public debt from 1980 to 1986. In the subsequent years public expenditure is less than public debt with the exception of 1997.

Figure 2: Public Sector Expenditure and Debt, 1980-2018



Source: Economic Surveys, Kenya National Bureau of Statistics

Public expenditure was highest in 1986 at 79% and lowest in 2011 at 27% with an average of 38%. Public debt on the other hand was considered highest in 1993 at 96% and lowest in 1980 at 19% with an average of 49%. The government's fiscal policies between 1980 and 1986 were geared towards stimulating economic growth following the 1984 drought and the effects of the 1979 oil crisis. Focus was majorly on the private sector thus adopting domestic borrowing policy that would not crowd out private investors. Although there has been irregular growth patterns for both public expenditure and public debt, it can be noted that during the electioneering periods 1993, 1997, 2002, 2013 and 2017 political factors among others tend to influence increased expenditure and borrowing. Similarly, the growth in 1997 is attributed to major drought experienced in the country hence a lot of resources were channeled to famine stricken areas whereas in 1993 and 2000 it is attributed to various reforms including the Structural Adjustment Programmes (SAPs) imposed on most of the African countries as a conditionality for World Bank and IMF donor funds (Economic Surveys, various issues).

The period from 2002 to 2013 brought about structural reforms and new policies aimed at accelerating growth in the economy and improving quality of life for Kenyans. Among the policies included: Recovery strategy for creating wealth and employment under which GDP growth increased to 7% in 2007; Millennium Development Goals (MDGs) that all African countries were expected to achieve by the year 2015; the Kenya Vision 2030 that was to be implemented in phases of five years each; and the Constitution of Kenya 2010. All these policies and reforms have led to expansionary fiscal measures reflected in high infrastructure expenditure, social expenditures and military expenditure for the period reviewed. The country has witnessed a GDP growth of 8.4% in 2010, 6.1% in 2011 and currently oscillates at 4.9% to 5.9%. The current GDP growth is way below the MTP I target of a double digit of 10% in 2012 and was to be maintained in the subsequent implementation phases of the Kenya Vision 2030.

1.6 Problem Statement

Tax revenue in most African countries is low whereas public expenditure has continued to increase, Governments are therefore grappling with the challenge of financing infrastructure development projects geared towards boosting economic growth and improving living standards, from external sources (African Economic Outlook, 2018). The implication of deficit financing through borrowing is that, the debt burden, if not well managed may dim envisaged growth prospects in Africa. Kenya just like majority of countries in Africa, has had a significant change in the size and composition of government in last decade as mirrored in the Kenya's current public expenditures growth. The government expenditure has increased from Kshs. 268.43 billion in FY 2000/01 to Kshs 956.23 billion in FY 2010/11 and Kshs. 2.778 trillion in FY 2017/18 without a resultant change in revenue (Economic Surveys, various issues).

The expansion on public expenditure has not only led to crowding out of funding for development projects expected to propel the country's economic growth but also widened the fiscal deficit (Yagan, 2014). There have been several austerity measures and various tax reforms to enhance revenue yet the deficit has continued to escalate. According to the 2018 Budget Policy Statement (BPS) fiscal deficit to GDP for the FY 2017/18 was 7.2% which is way above the IMF global threshold of 3%. Persistent and high fiscal deficit implies that government will continue to finance public expenditure through borrowing and in turn lead to high debt growth

(Osoro, 2016 and Kiminyei, 2014). There is need for revenue mobilization, prudent utilization of the available resources and rationalization of public expenditure.

Further, discussion on how public sector expenditure and debt should relate is still unconcluded considering conflicting views in current literature. Some cross-country studies found that public sector expenditure has a positive effect on public debt (Odo et al., 2016; Uguru, 2016; Ukwueze, 2015; Mah et al., 2013; Okafor & Eiya, 2011; Sinha et al., 2011) while other studies found insignificant or negative effect of public expenditure on public debt (Stegarescu, 2013 and Swamy, 2015). Specific studies in Kenya by Kiminyei (2014) and Kanano (2006) have shown positive correlation between public expenditure and public debt albeit without disaggregating public expenditure. Existing studies have concentrated on public debt and economic growth (Chongo, 2013; Mwaniki, 2016; Putunoi & Mutuku, 2013), and public expenditure on economic growth (Taiwo & Agbatogun, 2011 and Muthui et al., 2013).

Kenya has undergone political and economic structural change in the last decade; this study therefore seeks to incorporate the most recent data as recommended by Kiminyei (2014) and Bittencourt (2013). The gap occasioned by political and economic reforms since the previous studies were undertaken, and the limited studies on the nexus as well as nature of causality between public sector expenditure and debt has informed the study's objective. By determining the nexus and nature of causality between public sector expenditure and debt in Kenya, identified gaps will be filled.

1.7 Research Questions

The following research questions will be answered by this study:

- i. What is the direction of causality between public expenditure and public debt in Kenya?
- ii. Is there a long run relationship between public expenditure and public debt in Kenya?

1.8 Research Objectives

The main objective of the study is to establish the nexus between public sector expenditure and public debt in Kenya. Specific objectives are to:

- i. Determine the direction of causality between public expenditure and public debt in Kenya.
- ii. Establish existence of a long run relationship between public expenditure and public debt in Kenya.
- iii. Recommend policies as per the study findings.

1.9 Relevance of the Study

Public borrowing is an important fiscal measure in developing economies, Kenya included. This study is therefore of great importance to the policy making institutions. The outcome of the study will enable policy makers come up with informed decisions on public expenditure and public debt in Kenya. Kenya has ambitious development plans as spelt out in the Vision 2030, respective MTPs, other national, and international development priorities aimed at accelerating growth and improving citizens' quality of life. This will require huge financial investments partly to be sustained through domestic and external borrowing given the limited revenue. In the context of the county's development agenda, there is need for effective and efficient utilization of public resources including public debt.

The findings of this study are hoped to help policy makers adopt interventions to keep the public sector expenditure and public debt at sustainable levels and mitigate the risk of debt distress which could hinder or slow down realization of Kenya's development agenda. In addition, by incorporating the most recent data, the study seeks to add to the limited data that already exists on the nexus and causality between public expenditure and public debt.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

Theoretical literature on public debt and their linkage to public sector expenditure, empirical literature on findings of previous studies on public expenditure and public debt as well as an overview of literature highlighting existing gaps are presented in this chapter.

2.1 Theoretical Literature

The public expenditure theory associated with a German economist Adolph Wagner (1835 - 1917) is considered among the earliest theories. He analyzed trends in growth and the size of public expenditure and found out that government spending, including payment wages and salaries, tends to increase as a share of GDP as Nations develop. This means that a rise in national income triggers increased demand for public goods and services thus occasion an expansion of public sector (Ndonga 2014; Ukwueze, 2015; and IMF, 2016).

Similarly, Wiseman and Peacock (1961) in their analysis of United Kingdom's growth of public expenditure aver that an increase in public expenditure follows a 'jack or stepwise' fashion and not a straight line. The expectations of tax payers as economic agents is that the government ought to provide goods such as public infrastructure and utilities as well as services to its citizens. From their analysis, public sector expands as a result of social crisis and that the government's revenue cannot meet the increase in expenditure. This movement of level of expenditure from a low level to new or higher level is referred to as displacement effect. The government therefore bridges the resource gap through borrowing which in turn leads to public debt (Antonis et al., 2013 and Uguru, 2016).

Classical economists' (between 1742 -1859) debt theory maintained that debt imposed a burden on future generations and that very high levels of public debt would create national bankruptcy (Kiminyei, 2016). Buchanan (1958, cited in Templeman 2007) in support of the classical school of thought refers to public debt as a burden to future taxpayers since the cost of currently financed expenditure is postponed in time. He points out that bondholders voluntarily make a

rational choice from a multiple investment opportunities in anticipation of settlement of the principal amount and payment of accrued interest. The voluntary nature of the bondholders lending implies that they become better off upon payment and that by financing current public expenditure they did not bear the real burden of debt. To the bondholders, the burden of debt was a utility loss as opposed to financial loss since they will ultimately be repaid from future taxes. Tax payers bear the real burden of their current debt-financed expenditure (Templeman, 2007).

Besides the burden of principal repayment passed on to the future generations, public debt attracts some cost known as interest on debt. The interest payment negatively affects the net wealth of a borrower and in turn reduces the future living standards if used to finance increased present consumption. Buchanan considered debt as immoral since the repayment of principal debt amount plus interest is passed on to the future generation who do participate in decision making and more so when resources availed through debt are spent on unproductive government expenditures. Classical economists favored balanced budgets, that is, all government expenditures were to be financed by taxation, and that budget deficits which resulted to borrowing should only be considered during natural emergencies like war or natural disaster (Templeman, 2007 and Kiminyei, 2014).

Ricardian Equivalence Theorem ascribes to Ricardo (1772-1823) and it postulates that tax revenue and debt are similar forms of financing public expenditure considering that government will redeem its debt in future. The theory is based on two assumptions; firstly, government budget constraint like consumer budget constraint is not permanent given that at some point government expenditure should equal revenue. Secondly, consumers are rational and forward looking. This implies that in anticipation of future taxes, their consumption would reduce whenever increasing government expenditure was financed by debt (Kiminyei, 2014). In addition, the theory supposes that in a closed economy, increased future taxation will lead to repayment of debt whereas in an open economy the government will sell assets to international institutional agents in order to redeem its debt. Barro (1974) and Sala-i-Martin (2003) argue that using either taxation or borrowing to finance public expenditures will essentially yield the same results (Tsoulfidis, 2008 and Mwaniki, 2016).

According to Keynes (1936, cited in Kiminyei, 2014), the economy has various forces and mechanisms pushing it into disequilibria. This was contrary Say's law that market forces of supply and demand left alone were unable to deliver an equilibrium with economic efficiency gains (Kiminyei, 2014). Keynes favored borrowing to finance public expenditure to avoid a forced balanced budget. Forced balance budget implied that the government was taking from one hand from what it was giving the other and this would in turn be disastrous to a poor economy (Kiminyei, 2014 and Mwaniki, 2016).

Keynes's conclusion was that public debt is favorable in the short-run particularly when the economy is at recession. At recession time, changes in aggregate demand lead to minimal investment, high unemployment and lower growth rate (Blinder, 2012). Further, debt will not burden future generations for as long as the GDP trajectory and speed remains positive. This is because, high aggregate demand due to high government expenditure is necessary to diminish debt. In the same breadth, the government utilizes surplus savings held by public through borrowing to finance public expenditure. The borrowing if channeled to worthwhile investments will increase national output. Keynes however cautions against debt financing at a level that may crowd out private investors (Kiminyei, 2014 and Mwaniki, 2016).

2.2 Empirical Literature

2.2.1 Public Expenditure Causes Public Debt

Sinha, et al., (2011) analyzed panel pool data on 31 countries grouped into middle income and high income, to understand the determinants of public debt. Total effects, cross fixed effect and cross section models were to determine the variables. Autoregressive multiple regression model was employed to estimate debt figures. The study revealed that GDP, government expenditure including education expenses and balance of the current account influenced public debt in all countries. The study does not however reveal whether the influence of the variables on public debt is either long-run or short-run.

Mothibi & Mncayi (2019) investigated South Africa's public debt factors for the period 1994 to 2017. ADF and PP test were conducted. Auto regressive distributive lag (ARDL) model results shows that a long run relationship exist between real GDP, inflation, real interest rates, public

debt and expenditure. Key drivers being public expenditure, real GDP and interest rates. Public debt however affected economic growth and inflation negatively. They recommend that the government improves its productive capacity, control interest rates, eliminate unprofitable expenditure and limit bail-out on non-performing and problematic state entities.

Taiwo & Agbatogun (2011) examined public expenditure effect on Nigeria's economic growth from 1980 to 2009. Error correction model results revealed that development expenditure, inflation, degree of openness and revenue are significant variables to enhance growth. Their recommendation was that there is need for diversity on revenue collection as opposed to procuring huge debt internally or externally.

Mah et al., (2013) sought to determine government expenditure influence on debt in Greece from 1976 to 2011. Philip Perron and ADF tests were conducted, VECM and granger causality test were used for analysis. VECM results showed that an increase in either gross national expenditure or inflation caused a significant increase in government debt whereas an increase in either gross national income or net foreign direct investment had a significant negative effect on debt. In addition, causality runs from gross national government expenditure to general government debt but not vice versa. Their recommendation is that fiscal policies be reviewed to enable countries minimize debt accumulation to sustainable levels.

Uguru (2016) analyzed Nigeria's public debt and government expenditure for the period 1980 to 2013. Employing OLS regression technique, he found out that government expenditure and public debt have a positive and significant relationship. He recommends that recurrent expenditure be lower than and capital expenditure for Nigeria's Vision 2020 to become a reality. Similarly the study advocates for diversification so as to reduce overdependence on crude oil revenue and in turn control government's accumulation of debt. Stationarity test for the time series was not conducted yet OLS was employed and so the relationship may be spurious.

Odo et al., (2016) examined the link between Nigeria's total public debt and expenditure from 1980 to 2015. They used ADF and PP tests, Johansen cointegration technique and VECM. The findings reveal that both public development and recurrent expenditures affect public debt

positively and the relationship is significant. Further, unidirectional causality runs from both categories of expenditure implying government borrowing is triggered by government deficit budgeting. They recommended introduction of current global practice in public finance at both federal and state levels in Nigeria.

Kiminyei (2014) analyzed Kenya's revenue, public expenditure and debt from 1960 to 2012. Johansen & Juselius co-integration technique and VECM were employed. There was a significant positive correlation between revenue from taxes, expenditure and debt. To control accumulation of public debt, he recommends that tax revenues be enhanced possibly by sealing loopholes for tax evasion. In addition, he proposes prioritization of expenditure on key sectors that will boost overall productivity of the economy as a necessity for fiscal discipline and fiscal consolidation. He did not incorporate structural reforms and most recent data in determining the relationship.

Belguith & Omrane (2017) empirically investigated the factors that determine Tunisia's public debt for the period 1986-2015. VECM findings revealed that changes in inflation and investment negatively affected public debt whereas the effect of rate of interest, deficit and trade openings was positive. Budget deficit turned out to be the major contributor to public debt accumulation. The study recommends for reduction in debt deficit through continuous fiscal adjustment as well as improved productive apparatus for Tunisia's sustained economic growth of 5%, regulation of interest rate, improvement of tax system and rationalization of budget choices.

Stegarescu (2013) investigated how the degree of indebtedness is influenced by composition of sub-national government expenditure in 34 West-German states for the period 1974 to 2010. He uses OLS pooled regression estimation technique for the analysis. The finding of the study reveals that besides socio-economic and political factors, the budget structure plays a crucial role in indebtedness. Specifically, high ratio of government consumption to investment expenditure increases debt while separate consideration of both investment and personnel expenditure were associated with lower debt. He recommends for reforms of tax sharing and equalization system.

2.2.2 Public Debt Causes Public Expenditure

Kanano (2006) analyzed Kenya's public expenditure growth from 1980 to 2004 using OLS method for a log linear model. The result reveals a significant positive relationship between public expenditure, internal debt and government revenue; and a negative relationship between public expenditure and external debt. He recommends that government reduces overreliance on internal borrowing, rationalizes expenditure as well as minimize wastage of public resources, and allocate adequate resources to capital expenditure so as to catapult economic growth. He only used ADF test for stationarity hence in the problem of serial correlation was not factored in plus the study was done more than a decade ago.

Okafor & Eiya (2011) sought to determine the factors responsible for Nigeria's public expenditure growth for the period 1999 to 2008. OLS technique revealed that inflation and population have a negative and positive effect on public expenditure respectively. Both borrowings and taxes positively affected public expenditure. They recommended for fiscal responsibility law to manage budget deficit and debt. The weakness of this study is failure to test for stationarity and thus the estimation may be spurious.

Ukwueze (2015) in a study on what determines government expenditure size in Nigeria from 1961 to 2012 using OLS concluded that revenue, national income and private investment influenced government expenditure. Internal and external debt influenced expenditure only in the short run. He recommended for revenue expansion, promotion of private investment growth, and reduction of debt accumulation. Despite non-stationarity of data, there was no attempt in determining cointegrating equations.

Oladokun (2015) examined the nature of causality between public expenditure and national debt in Nigeria from 1980 to 2012. Variables were estimated using bivariate pairwise granger causality. Domestic debt and expenditure exhibit a positive relationship, and that public expenditure granger cause domestic debt. He recommended that meaningful development requires wise spending of government resources in infrastructural facilities that can boost foreign

investment as opposed to unproductive areas which would in turn lead to heavy debt servicing annually. PP unit root tests was not conducted.

2.2.3 Mixed Studies on Public Expenditure and Public Debt

Swamy (2015) investigated macro-economic variables that determine government debt in 252 countries consisting of advanced, emerging and developing economies from 1980 to 2009. Granger causality test was conducted on panel data for eight (8) proxies for macroeconomic explanatory variables. Direct foreign investment, government expenditure, inflation and population have a negative effect on debt. In addition, author's hypothesis that rising government expenditures does not create an enabling environment for private investors is confirmed.

Bittencourt (2013) carried out a study to investigate the main factors responsible for domestic and external debts in South America's young democracies between 1970 and 2007. Findings reveal that economic growth deters rise in debt whereas inflation, inequality and constraints on the executive affects debt positively. He therefore recommends an economic environment geared towards prosperity and productivity is vital for low and sustainable debt levels in South America.

Folorunso & Falade (2013) analyzed nexus between Nigeria's fiscal deficit and public debt for the period 1970 to 2011. They disaggregated debt into domestic and external so as to analyses the nature of causality between each category of debt and the fiscal deficit. Pairwise Granger causality reveals that fiscal balance and domestic debt granger cause each other whereas causality from runs from external debt to fiscal deficit. Further, fiscal deficit affects public debt positively while domestic debt had the largest influence on fiscal deficit. They recommended for an optimal balance between internal and external debt in bridging budget gap.

2.3 Overview of Literature

Attention paid to public expenditure and public debt in East Africa, Kenya in particular is minimal. The studies that have been undertaken so far are mostly in Nigeria, Tunisia, South Africa, Greece, West -Germany and South America. Some cross-country studies found that public expenditure has a positive effect on public debt while other studies found insignificant or negative effect of public expenditure on public debt. Majority of studies examined the nature of

causality between the two variables with an exception of Mah et al., (2013), Odo et al., (2016), Oladakun (2015), and Swamy (2015). The direction of causality also varies from the one study to the other therefore inconclusive.

Further, the literature that exists in Kenya has focused on domestic public debt (Putunoi & Mutuku, 2013) or public debt (Mwaniki, 2016), amongst others, on economic growth. The only two studies that attempted to examine the nexus between Kenya's public debt and public expenditure are Kiminyei (2014) and Kanano (2006) thereby revealing a positive correlation. None of the studies in Kenya have attempted to establish the nature of causality between the aforementioned variables, a gap that this study seeks to fill. In addition, the studies in Kenya have not incorporated most recent data particularly political structure reforms.

The tests and estimation techniques that have been widely used are ADF, PP, cointegration, granger causality, VECM and ARDL model. This study therefore seeks to incorporate the most recent data, introduce structural reforms as a dummy variable, disaggregate the public expenditure into recurrent and development as well as establish the nature of causality between public expenditure and public debt. This will in turn contribute to the available limited literature on the aforementioned variables.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

Methodological approach in the analysis of public sector expenditure and public debt in Kenya, data sources and estimation techniques are defined in this chapter.

3.1 Theoretical Framework

The study adopts three gap model; fiscal constraint gap, foreign exchange gap and saving-investment gap identified as the possible sources of debt accumulation (Waheed, 2017). The fiscal constraint gap is very critical for developing countries like Kenya where political factors are likely to affect the fiscal sector. This is because the political factors tend to influence the budget through increased expenditure and borrowing particularly during transition periods (Chiminya & Nicolaidou, 2015).

Financing budget deficit maybe through government borrowing, currency printing amongst other avenues (Waheed, 2017). The budget constraint can take the form below:

$$TR_t + (DT_t - DT_{t-1}) = GE_t + rDT_{t-1} \dots \dots \dots (1)$$

TR_t , DT_t , DT_{t-1} , GE_t and r represents government revenue, current debt, previous debt, government expenditure and interest on debt respectively.

Constraint from equation (1) can further be simplified as:

$$DT_t = GE_t - TR_t + (1 + r)DT_{t-1} \dots \dots \dots (2)$$

Where, $GE_t - TR_t$ represents the primary budget gap. When government expenditure including interest on debt increases, government debt will also increase whereas an increase in government revenue reduces borrowing.

Debt accumulates from the balance of payment gap as follows:

$$CAB = XP_t - MP_t - rDT_{t-1} \dots \dots \dots (3)$$

$$KAB = (DT_t - DT_{t-1}) + (R_t - R_{t-1}) \dots \dots \dots (4)$$

Balance from the current account is represented by CAB whereas balance from the capital account is represented by KAB. XP_t , MP_t and R stands for exports, imports and international reserve respectively.

$CAB + KAB = 0$, equation (4) is therefore re-written as:

$$DT_t = MP_t - XP_t + (1 + r)DT_{t-1} - \Delta R_t \dots \dots \dots (5)$$

Saving and investment gap is as follows:

$$S_t + (DT_t - DT_{t-1}) = I_t + rDT_{t-1} \dots \dots \dots (6)$$

S_t and I_t equals savings and investment respectively. Re-writing equation (6) results into the following debt identity

$$DT_t = I_t - S_t + (1 + r)DT_{t-1} \dots \dots \dots (7)$$

From equations (2), (5) and (7), we note main economic factors affecting a nation's debt. The identified economic factors are anchored on the responsibility of the government as far as a nation's economic growth and development is concerned (Chiminya and Nicolaidou, 2015).

3.2 Model Specification

This study adopts economic factors from the fiscal constraint gap model hence takes the form

$$PD = f(PE) \dots \dots \dots (8)$$

Where PD is public debt while PE is public expenditure.

Based on the literature reviewed, rising public expenditure results to rising public debt (Odo et al., 2016; Uguru, 2016; Ukwueze, 2015; Mah et al., 2013; Okafor & Eiya, 2011; Sinha et al., 2011). Therefore public debt is a function of public expenditure. Similarly, in the literature reviewed public debt has more than one independent variable. Desired threshold for recurrent expenditure against the total expenditure in Kenya should be 70% whereas development expenditure should account for 30%. When development to recurrent ratio is such that it favors unproductive recurrent expenditures, then the Government will be forced to borrow so as to fund

its development expenditure. Similarly if resources are diverted to unproductive development expenditure, Government will continue to accumulate debt. This is because there will be no returns from productive investments to repay the debt. Further if the revenue is relatively low such that there is a resource gap, government borrowing will be inevitable hence accumulation of public debt and an equivalent interest on the said debt (Chongo, 2013; Kiminyei 2014; and Osoro, 2016).

This study therefore further disaggregates public expenditure into recurrent and development expenditure and introduces a dummy variable to determine the effect of election years and structure of government on public debt hence takes the form below:

$$PD_t = \beta_0 + \beta_1RGE_t + \beta_2DGE_t + \beta_3EX_t + \beta_4RVE_t + \beta_5INF_t + \beta_6D_1 + \beta_7D_2 + \mu_t \dots\dots\dots (9)$$

Where; PD is public debt, RGE is recurrent expenditure, DGE is development expenditure and μ_t is the error term. The control variables are exchange rate (EX), revenue (RVE), Inflation (INF), election years (D_1) and structure of government (D_2).

The dummies have been picked to show how changes in political regimes and government structures may have had a significant change in public expenditure composition and growth in Kenya from the period 1980 to 2018. Each dummy has been adopted for the various political reforms as follow: D_1 will be for the election years hence code (1) for elections and code (0) otherwise; and D_2 will stand for the structure of government where code (1) will represent bicameral system and code (0) otherwise.

3.3 Description and Measurement of Variables

Table 2 shows variables with their respective description, measurements and expected sign for this study.

Table 2: Variable Definition, Measurements and Expected Sign

Variable		Description and Measurement	Expected Sign
PD	Public debt	Comprises both internal and external debt measured as a proportion of GDP.	Dependent variable
RGE	Recurrent expenditure	This is the total expenditure on government's recurrent items measured as a proportion of GDP.	Positive (Odo et al., 2016)
DGE	Development expenditure	It is the total expenditure on government's capital or development projects measured as a percentage of GDP.	Positive (Odo et al., 2016)
EX	Exchange rate	Measured as an average of Kenya's exchange rate against the US dollar.	Positive (Saheed et al., 2015)
INF	Inflation	Change in consumer price index.	Negative (Belguith & Omrane, 2017 and Swamy, 2015)
RVE	Government revenue	This is an aggregate of government's revenue measured as a percentage of GDP.	Positive (Kiminyei, 2014)
D1	Election years	It is dummy for election years that trigger sudden changes in public expenditure and public debt. Where either code 1 or 0 will be provided for respective years.	Positive (Chiminya & Nicolaidou, 2015)
D2	Structure of government	It is dummy for changes in structure of government. Where code 1 will be provided for bicameral structure of government and 0 otherwise.	Positive (Chiminya & Nicolaidou, 2015)

3.4 Diagnostic Tests

The study used time series data thus several tests were conducted determine a suitable model. OLS being one of the classical methods of estimation is not suitable for non-stationary series since it will yield false relationships. The following tests were conducted:

3.4.1 Unit Root Test

To avoid running a regression with meaningless results and invalid co-efficient estimates time series data underwent stationarity test. A stationary series has its mean and variance remaining static over time. There are several tests for stationarity however the study focused on ADF Test and PP test to tackle serial correlation. ADF test assumes the following equation (Gujarati, 2004):

$$\Delta Y_t = \alpha + \beta_t + \delta Y_{t-1} + \sum_{i=1}^m \phi_i \Delta Y_{t-1} + \varepsilon_t \dots \dots \dots (10)$$

Where ΔY_t is the difference operator, $\delta = (p-1)$ and $-1 \leq p \leq 1$. If $\delta = 0$ then $p=1$ implying that the time series data is non-stationary where as if $p < 1$ then time series is stationary. The null hypothesis is that there is unit root, that is, $\delta = 0$

Based on the variables of interest and the data used, it was important to check and control for structural breaks. Structural breaks refers to sudden changes in time series data. DF and ADF do not allow for structural breaks. PP test allows for structural break but does not provide for specific break points. The structural breaks are considered to be non-stationary if the DF tests are applied. This study used Zivot and Andrews (1992) test to check for structural breaks. The assumption of Zivot and Andrews (ZA) test is that the exact break-point in the time series is unknown which is contrary to Perron's original test assumption on break-points. ZA proposes three models for unit test where; model E allows one-off variation in level of the series, model F allows for one-off variation in the slope of the series while model G allows for combination of both E and F. The three (3) equations are as follows (Geda et al., 2012 and Waheed et al., 2007):

Model E

$$\Delta y_t = c + \alpha y_{t-1} + \beta_t + \gamma DU_t + \sum_{j=1}^k d_j \Delta y_{t-1} + \varepsilon_t \dots \dots \dots (11)$$

Model F

$$\Delta y_t = c + \alpha y_{t-1} + \beta_t + \Phi DT_t + \sum_{j=1}^k d_j \Delta y_{t-1} + \varepsilon_t \dots \dots \dots (12)$$

Model G

$$\Delta y_t = c + \alpha y_{t-1} + \beta_t + \gamma DU_t + \Phi DT_t + \sum_{j=1}^k d_j \Delta y_{t-j} + \varepsilon_t \dots \dots \dots (13)$$

Where DU_t and DT_t are dummy variables for a shift in level and slope of series respectively. The null hypothesis in models E, F and G is $\alpha=0$ indicating that the series contains a unit root with a drift excluding any structural breaks. If $\alpha < 0$ the null hypothesis should be rejected.

3.4.2 Cointegration

This refers to transformation of a linear combination of non-stationary variables into stationary variables over time. The time series was further subjected to cointegration tests so as to confirm whether there existed long-run equilibrium relationships. Cointegration refers to a condition that linear combination of non-stationary variables in a regression equation becomes stationary over time. Among the methods of testing cointegration between variables is the Johansen approach (Geda et al., 2012). The study employed the Johansen cointegration technique for the proposed multivariate model in equation (9)

VAR model equation for cointegration is as follows (Johansen, 1991):

$$X_t = \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} - X_{t-k} + \mu + \Phi D_1 + \varepsilon_t \quad (t = 1, \dots, T) \dots \dots \dots (14)$$

X_t represents an (n x1) vector of macro variables of interest while D_1 is a vector of seasonal dummies

Equation (16) can be expressed in first difference form by introducing a lag operator (L)

$\Delta = 1 - L$ as below:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k-1} + \Pi X_{t-k} + \mu + \Phi D_1 + \varepsilon_t \quad (t = 1, \dots, T) \dots \dots \dots (15)$$

Where

$$\Gamma_i = -(I - \Pi_1 - \dots - \Pi_i), \quad (i = 1, \dots, k - 1) \quad \text{and} \quad \Pi = -(I - \Pi_1 - \dots - \Pi_k)$$

To estimate for cointegrating vectors, Johansen proposes two tests that take the following forms (Geda et al., 2012):

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \dots \dots \dots (16)$$

$$\lambda_{max}(r, r + 1) = -T \ln(1 - \hat{\lambda}_{r+1}) \dots \dots \dots (17)$$

$\hat{\lambda}$ - represents eigen values obtained from estimated matrix,

λ_{trace} - tests expected cointegrating vectors ($\leq r$)

λ_{max} - tests the null that the number of cointegrating vector, and

T - represents sample size.

3.4.3 Normality

The assumption of a normal distribution of the disturbance term whose variance is constant and mean is zero should not be violated. The disturbance term captures effect of all other variables. Jarque-Bera test for normality was conducted so as to ensure that those variables excluded from the model have a minimum effect on debt.

3.4.4 Autocorrelation

This occurs when two random error terms of successive time periods are found to be correlated. LM correlation test was used to check for this situation so as to avoid spurious results. The null hypothesis is that there is correlation between two random error terms. If p value was found to be more than five percent then the alternative hypothesis is accepted.

3.4.5 Multicollinearity

This is a characteristic of time series data occasioned by correlation between more than one control variable in the model. Correlation matrix was used to check for the same. In the event of severe multicollinearity, a highly correlated variable to the other should be dropped assuming that there will be no effect on the model.

3.5 Granger Causality

Granger causality test was undertaken to establish the direction of causality between public expenditure (PE) and public debt (PD).

$$PD_t = \alpha_1 + \sum_{i=1}^p \beta_1 PD_{t-1} + \sum_{j=1}^q \beta_2 PE_{t-j} + \varepsilon_t \dots \dots \dots (18)$$

$$PE_t = \alpha_2 + \sum_{i=1}^m \phi_1 PE_{t-1} + \sum_{j=1}^q \phi_2 PD_{t-j} + \varepsilon_t \dots \dots \dots (19)$$

From equations (18) and (19) the null hypotheses will be as follows:

Unidirectional causality from PE_t to PD_t

$$\sum_{j=1}^q \beta_2 \neq 0 ; \text{ and } \sum_{j=1}^q \phi_2 = 0 \dots \dots \dots (20)$$

Unidirectional causality from PD_t to PE_t

$$\sum_{j=1}^q \beta_2 = 0 ; \text{ and } \sum_{j=1}^q \Phi_2 \neq 0 \dots \dots \dots (21)$$

Bidirectional causality

$$\sum_{j=1}^q \beta_2 \neq 0 ; \text{ and } \sum_{j=1}^q \Phi_2 \neq 0 \dots \dots \dots (22)$$

3.6 Data Sources

For the objective of this study to be met, secondary annual data from various Economic Surveys in Kenya and the World Bank for the period 1980 to 2018 was acquired. The period was chosen as it incorporates different political, economic and structural reform changes. Further, the period was chosen because of data availability hence suitable for evidence based decisions for the policy makers.

CHAPTER FOUR: ANALYSIS OF DATA AND DISCUSSION OF RESULTS

4.0 Introduction

Descriptive statistics, analysis techniques, results of the findings and discussion are presented in this Chapter.

4.1 Descriptive Statistics

Descriptive statistics helped to understand the statistical properties of the used data. The descriptive statistics outlining the statistical properties of data for six variables (excluding dummies) is illustrated in table 3.

Table 3: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.	Var.	Skew.	Kurt.
Public Debt (PD)	39	49.056	15.116	19.28	95.77	228.495	0.735	4.054
Recurrent Expenditure (RGE)	39	30.908	8.919	20.26	61.79	79.547	1.598	5.480
Development Expenditure (DGE)	39	7.392	3.577	2.38	19.3	12.797	1.335	5.679
Revenue (RVE)	39	24.868	5.784	19.07	45.95	33.452	1.824	6.386
Inflation (INF)	39	10.445	7.309	0.93	41.99	53.424	2.385	10.464
Exchange rate (EX)	39	56.898	31.041	7.42	103.41	963.550	-0.298	1.681

From table 3 above, all the six variables had 39 observations for the period 1980 to 2018 in Kenya. Public debt to GDP had a mean of 49.06% with a standard deviation of 15.12%, while minimum and the maximum values were at 19.28% and 95.77% respectively. Recurrent expenditure to GDP's mean is 30.91%, standard deviation is 8.92%, while it's minimum and the maximum values were at 20.26% and 61.79% respectively. Development expenditure to GDP's mean is 7.39%, standard deviation is 3.58%, while it's lowest and highest values were at 2.38% and 19.3% respectively. Revenue to GDP had a mean of 24.87% with a mean of 5.78% while the minimum and the maximum values were at 19.07% and 45.95% respectively. Inflation and

exchange rates had their mean and standard deviation at (10.45% and 7.31%) and (56.90 and 31.04) respectively. The highest and the lowest values for inflation and exchange rate stood at (41.99% and 0.93%) and (103.41 and 7.42) respectively. Public debt and exchange rate mirrors normal skewness while the remaining four (4) variables have positive skewness. Exchange rate is platykurtic while the remaining five variables are leptokurtic since their respective values are greater than 3. Skewness and Kurtosis measure the degree of asymmetry and peakness or flatness of a series respectively.

4.2 Correlation Matrix

Multicollinearity for six variables excluding dummies was tested by use of a correlation matrix as shown in table 4.

Table 4: Correlation Matrix

	Public Debt	Recurrent Expenditure	Development Expenditure	Revenue	Inflation	Exchange Rate
Public Debt	1.000					
Recurrent Expenditure	0.565*	1.000				
Development Expenditure	-0.622	0.377*	1.000			
Revenue	0.488*	0.861*	0.490*	1.000		
Inflation	0.161	0.202	0.005	0.237	1.000	
Exchange Rate	-0.020	-0.560*	-0.448*	-0.480*	-0.138	1.0000

From table 4 above correlation coefficients of recurrent expenditure, development expenditure, inflation and exchange rate are less than 0.6 except for revenue whose correlation co-efficient is greater than 0.6 but less than 0.9. An asterik (*) denotes significance at 5% level of confidence. The detailed correlation coefficient has been provided for in Appendix A. There is

multicollinearity between revenue and recurrent government expenditure since a positive shift in government revenue triggers a rise in recurrent government expenditure.

4.3 Unit Root Test

ADF test, PP test and ZA test were conducted to determine stationarity or non-stationarity of the data. Results are illustrated in tables 5, 6 and 7 respectively.

Table 5: Unit Root Test Using ADF

Variable	t-statistics at Levels			t-statistics at First Difference		
	Drift	Trend	Suppressing Constant	Drift	Trend	Suppressing Constant
PD	-2.065	-2.943	-0.326	-4.597	-4.532	-4.685
RGE	-1.578	-4.657	-0.784	-4.538	4.387	-4.454
DGE	-2.668	-1.939	-2.010	-3.249	-3.868	-3.203
RVE	-2.563	-4.678	-0.968	-3.844	-7.761	-3.768
INF	-2.752	-2.867	-1.135	-2.500	-2.466	- 2.544
EX	-0.880	-1.722	1.272	-2.827	-2.831	-1.795

The Critical values for ADF at first difference for drift are -2.473, -1.702 and -1.314 at 1%, 5% and 10% respectively; for trend are -4.306, -3.568 and -3.221 at 1%, 5% and 10% respectively; and for suppressing the constant are -2.467, -1.950 and -1.603 at 1%, 5% and 10% respectively. Public debt, recurrent expenditure, development expenditure and revenue are stationary after first difference. Inflation and Exchange rate are stationary at second difference implying that they are I (2) variables based on ADF tests at lag 4.

The time series was further tested for Unit root using PP since it is superior to ADF. Use of PP test introduces a correction to ADF statistic test (Geda et al., 2012). Table 6 shows the results.

Table 6: PP Unit Root Test

Variable		Test Statistic			
		Trend	Suppressing Constant	Trend	Suppressing Constant
PD	Z(rho)	-12.062	-0.342	-33.745	-33.355
	Z(t)	-3.153	-0.271	-6.195	-6.265
RGE	Z(rho)	-20.548	-0.528	-38.262	-38.129
	Z(t)	-4.409	-0.495	-8.354	-8.613
DGE	Z(rho)	-18.043	-1.942	-53.229	-53.595
	Z(t)	-3.253	-1.167	-11.673	-11.799
RVE	Z(rho)	-22.195	-0.539	-43.782	-43.615
	Z(t)	-4.157	-0.550	-8.205	-8.431
INF	Z(rho)	-33.454	-7.913	-49.612	-49.631
	Z(t)	-4.863	-2.144	-11.046	-11.376
EX	Z(rho)	-8.196	1.112	-32.815	-31.731
	Z(t)	-2.019	1.932	-5.635	-4.955

The Critical values for PP at first difference for suppressing constant are -12.380, -7.492 and -5.396 at 1%, 5% and 10% while for trend are -24.036, -18.812 and -16.176 at 1%, 5% and 10% respectively. The test focused on the Z(rho) statistic for PP since it is equivalent to Z(t) statistics for ADF. The results in table 6 reveal that all the variables are stationary at first difference as confirmed by test statistics that turned out to be greater than respective critical values at 1%, 5% and 10%.

To take into consideration structural breaks, ZA test was also conducted as shown in table 7.

Table 7: Unit Root Test Using ZA Test

Variables	At Levels		At First Difference	
	t-statistics	Year	t-statistics	Year
PD	-3.699	2005	-6.847	1994
RGE	-4.889	1998	-8.955	1987
DGE	-3.610	1987	-11.404	1987
RVE	-5.043	1987	-9.285	1987
INF	-5.939	1998	-8.028	1997
EX	-4.306	1993	-6.153	2002

The critical values are -5.34, -4.80 and -4.58 at 1%, 5% and 10% respectively. The results using ZA revealed that inflation rate is stationary at levels implying that the variable is I(0) at 5%. Public debt, recurrent expenditure, development expenditure, revenue and exchange rate non-stationary at first difference as the t statistics are greater than the respective critical values at 1%, 5% and 10%. The structural break points are given as 2005 for public debt, 1993 for exchange rate, 1998 for both recurrent expenditure and exchange rate, and 1987 for both development expenditure and revenue as shown in table 7.

The structural break points at first difference are given as 1994 for public debt, 1997 for inflation, 2002 for exchange rate, 1987 for recurrent government expenditure and development government expenditure. Structural break points for development government expenditure and revenue are consistent at levels and first difference in 1997. Structural break points turns out to be mostly election years (1987, 1997, and 2002).

4.4 Lag Order Selection

In preparation for cointegration tests and fitting of the best model, lag order was estimated using Vector Auto Regressive Specification Order Criterion (VARSOC).

Table 8: Selection of Lag Order

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-709.189				2.3e+10	40.868	40.96	41.135
1	-598.387	221.6	36	0.000	3.2e+08	36.594	37.238	38.46*
2	-541.971	112.83	36	0.000	1.2e+08	35.427	36.623	38.893
3	-496.643	90.656	36	0.000	1.3e+08	34.894	36.643	39.960
4	-414.269	164.75*	36	0.000	3.6e+07*	32.244*	34.545*	38.910

*indicates the selected lag order

Final prediction error (FPE), Hannan-Quinn information criterion (HQIC) and Akaike's information criterion (AIC) yielded four (4) lags while Schwarz's Bayesian information criterion (SBIC) yielded two (2) lags. The study picked four (4) lags since it was the minimum value in the three (3) out of the four (4) selection criterion used.

4.5 Cointegration Test

Due to non-stationary of all variables at levels as expressed in table 6, it was important to carry out a cointegration test to establish existence of long-run relationship between selected variables. Johansen cointegration test was performed based on the PP findings. The results for cointegration test are illustrated in tables 9 and 10.

Table 9: Cointegration Test based on Trace Statistics

Maximum rank	parms	LL	eigenvalue	trace statistics	5% critical value
0	114	-537.560	.	246.582	94.15
1	125	-464.504	0.985	100.471	68.52
2	134	-445.216	0.668	61.895	47.21
3	141	-431.389	0.546	34.240	29.68
4	146	-420.933	0.450	13.328*	15.41
5	149	-415.654	0.260	2.770	3.76
6	150	-414.269	0.076		

Table 10: Cointegration Test based on the Max Statistics

Maximum rank	parms	LL	eigenvalue	max statistics	5% critical value
0	114	-537.560	.	146.582	39.37
1	125	-464.504	0.985	38.577	33.46
2	134	-445.216	0.668	27.654	27.07
3	141	-431.389	0.546	20.912	20.97
4	146	-420.933	0.450	10.559	14.07
5	149	-415.654	0.260	2.770	3.76
6	150	-414.269	0.076		

The null hypothesis being absence of cointegration. Results from tables 9 and 10 reveal rejection of the null hypothesis since both the trace statistics (246.582) and the max statistics (146.582) are above the 5% critical values of 94.15 and 39.37 respectively. At the fourth maximum rank, trace (13.328) and the max (10.559) statistics do not exceed respective critical values of 15.41 and 14.07 implying existence of four (4) cointegrating vectors.

4.6 Vector Error Correction Model (VECM)

Use of VECM is allowed when variables are integrated of the same order and that there is presence of at least one (1) cointegrating vector amongst the variables. Model is based on PP results confirming I(1) variables as well as existence of four (4) cointegrating vectors. Equation (9) is therefore re-written to incorporate the lagged error correction term (ECT_{t-1}) as follows:

$$PD_t = \beta_0 + \beta_1RGE_t + \beta_2DGE_t + \beta_3EX_t + \beta_4RVE_t + \beta_5INF_t + \beta_6D_1 + \beta_7D_2 + \mu_t + ECT_{t-1} \dots \dots \dots (23)$$

VECM results are illustrated in tables 11 and 12 respectively.

Table 11: VECM Short-run Results

Sample:	1983 – 2018	Number of obs:	=	36
Log likelihood =	-415.138	AIC	=	33.285
		HQIC	=	36.110
Det (sigma_ml) =	1.434	SBIC	=	41.379

Variable	Co-efficient	Std. Error	z	p> z
D_PD				
_ce1 L1.	-1.610	.500	-3.22	0.001
_ce2 L1.	4.738	1.972	2.40	0.016
_ce3 L1.	-1.099	.687	-1.60	0.109
_ce4 L1.	-3.546	1.672	-2.12	0.034
PD				
LD	.359	.297	1.21	0.228
L2D	.254	.368	0.69	0.491
RGE				
LD	-2.460	1.490	-1.65	0.099
L2D	-1.472	.936	-1.57	0.116
DGE				
LD	1.619	1.076	1.50	0.133
L2D	2.268	1.000	2.63	0.009
RVE				
LD	2.190	1.852	1.18	0.237
L2D	.814	1.148	0.71	0.478
INF				
LD	1.003	.393	2.55	0.011

Variable	Co-efficient	Std. Error	z	p> z
L2D	-.195	.314	0.62	0.536
EX				
LD	.001	.520	0.00	0.998
L2D	.449	.724	0.62	0.535
D1				
LD	-.858	9.939	-0.09	0.931
L2D	-1.914	6.026	-0.32	0.751
D2				
LD	2.143	12.252	0.17	0.861
L2D	-14.149	11.275	-1.25	0.210
_cons	-.196	2.730	-0.07	0.943

From table 11 there two significant and negative speeds of adjustment. Firstly, ($_ce1$ L1.) which is significant at 1% (0.001) with a coefficient of (-1.610) and secondly, ($_ce4$ L4.) which is significant at 5% (0.034) with a coefficient of (-3.546). The coefficients (-1.610) and (-3.546) which is the error term suggests that deviations from the long run in the previous year are corrected in the present year at a faster convergence speed of 161% and 355%. The coefficients have a desired minus (-) and significant sign hence convergence to long run equilibrium and causal effect to public debt equation.

In the short run recurrent government expenditure has a significant negative effect on public debt at the first lag at 10%. This means that an increase in recurrent government expenditure by one (1) unit results to a decrease in public debt by 2.5 units. Development government expenditure has a positive effect on public debt at the second lag and is significant at 1% level of confidence. This means that an increase in development government expenditure by one (1) unit results to an increase in public debt by 2.3 units. Inflation has a significant positive effect on public debt at the first lag at 5% level of confidence implying that an increase in price level results to an increase in public debt by 1%. Revenue, exchange rate, election years and bicameral structure of government are insignificant.

Table 12: VECM Long-run relationship

Johansen normalization restriction imposed

Beta	Coef.	Std Err.	z	p> z
_ce1				
PD	1	.	.	.
RGE	-1.78e	.	.	.
DGE	-.3.89e	.	.	.
REV	1.78e	.	.	.
INF	2.052	1.471	1.40	0.163
EX	1.080	.266	4.06	0.000
D1	-276.285	38.541	-7.17	0.000
D2	-41.080	23.768	-1.73	0.084
_cons	-17.402			

The results in table 12 show that exchange rate (EX) has a negative effect on public debt significant at 1% whereas both election years (D1) and bicameral structure of government (D2) have a positive effect on public debt significant at 1% and 10% respectively.

The long run public debt equation illustrated in table 12 can be written as follows:

$$ECT_{t-1} = 1.000PD_{t-1} + 1.080EX_{t-1} - 276.29D_1 - 41.080D_2 - 17.402..... (24)$$

There are four (4) cointegrating equations (_ce1), (_ce2), (_ce3) and (_ce4) as provided for in Appendix B. An equilibrium relationship exists between exchange rate (EX) and bicameral structure of government (D2) with recurrent government expenditure (RGE) in equation two (-ce2). In equation three (-ce3), an equilibrium relationship exists between exchange rate (EX) and election years (D1) with development government expenditure (DGE). An equilibrium relationship exists between election years (D1) with revenue (RVE) in the fourth equation (_ce4).

4.7 Granger Causality

Granger causality was conducted between the public debt and the public expenditure. Public expenditure was broken down into recurrent expenditure and development expenditure. The results in table 13 reveal that public debt (PD) granger causes both recurrent (RGE) and development (DGE) government expenditures hence rejection of the null hypothesis. Recurrent expenditure (RGE) does not granger cause public debt whereas development expenditure (DGE) granger cause public debt. There is unidirectional causality running from public debt to recurrent expenditure whereas there is bidirectional causality between public debt and development government expenditure. Similarly, there is bidirectional causality between recurrent expenditure (RGE) and development expenditure (DGE).

An asterisk (*) in table 13 means that the null hypothesis is rejected.

Table 13: Granger Causality Wald Test

Null Hypothesis			Chi2	df	prob>chi2
	Equation	Excluded			
PD does not granger cause RGE*	PD	RGE	46.082	4	0.000
PD does not granger cause DGE*	PD	DGE	21.134	4	0.000
RGE does not granger cause PD	RGE	PD	4.5579	4	0.336
RGE does not granger cause DGE*	RGE	DGE	9.936	4	0.042
DGE does not granger cause PD*	DGE	PD	29.116	4	0.000
DGE does not granger cause RGE*	DGE	RGE	33.833	4	0.000

4.8 Post Estimation Tests

The following post estimation tests were conducted:

4.8.1 Autocorrelation

LM autocorrelation test was conducted. Null hypothesis being absence of autocorrelation as shown in table 14.

Table 14: LM Autocorrelation Test

Lags (p)	chi2	df	prob > chi2
1	69.465	36	0.001
2	27.900	36	0.831
3	39.470	36	0.318
4	38.824	36	0.344

Ho: no serial correlation

The results presented in table 14 shows that autocorrelation is present at the first lag since the probability is below 5%. Further, probability is less than chi square tests thus the null hypothesis is rejected. At the second, third and fourth lags the null hypothesis is accepted since the probability is greater than both chi2 test and 5%.

4.8.2 Normality Test

Jarque-Bera test was conducted to test for normality of the error terms. The results are illustrated in table 15.

Table 15: Normality Test using Jarque-Bera

Equation	chi2	df	prob>chi2
D_PD	7.232	2	0.027
D_RGE	5.852	2	0.054
D_DGE	6.731	2	0.035
D_RVE	0.380	2	0.827
D_INF	30.843	2	0.000
D_EX	5.560	2	0.062
D_D1	5.319	2	0.070
D_D2	9.854	2	0.007
ALL	71.770	16	0.000

Ho: normal distribution of error terms

The null hypothesis of normal distribution of the error terms is rejected since the p value of (0.027) is less than 5% in the first equation, as shown in table 15.

4.8.3 Model Stability Test

To determine the model's stability, eigenvalue stability condition test was conducted. The results are shown in table 16.

Table 16: Eigenvalue Stability condition

Eigenvalue	Modulus
1	1
1	1
1	1
1	1
.254 + .859i	.895
.254 - .859i	.895
-.633 + .495i	.804
-.633 - .495i	.804
-.094 + .794i	.799
-.094 - .794i	.799
-.748 + .224i	.781
-.748 - .224i	.781
-.774	.774
.276 + .688i	.741
.276 - .688i	.741
.660 + .273i	.715
.660 - .273i	.715
.436 + .554i	.705
.436 - .554i	.705
.636	.636
-.333 + .490i	.593
-.333 - .490i	.593
-.477	.476
-.135	.135

A model is said to be stable when the moduli of the remaining r eigenvalues do not exceed 1 and thus able to spread evenly within a unit circle. Table 16 shows that the remaining eigenvalues do not exceed one (1) implying that the model is well specified and thus stable.

CHAPTER FIVE: SUMMARY, CONCLUSION AND POLICY IMPLICATION

5.0 Introduction

A summary of the findings, conclusion, policy implications and proposed areas for further studies have been outlined in this chapter.

5.1 Summary

The study analyzed Kenya's public sector expenditure and public debt for the period 1980 to 2018. The objective was to establish existence of a long run relationship between public expenditure and public debt as well as to determine the direction of causality between public expenditure and public debt. ADF test, PP test and ZA test were conducted to test for stationarity of the time series data. ZA test was specifically employed to take care of structural breaks as well as to determine the break points. After establishing that the series was non-stationary at levels based on PP test, the time series was further subjected to cointegration test using Johansen Julius cointegration technique.

The purpose of the cointegration test was to establish whether long run equilibrium relationships exists between public debt, recurrent expenditure, development expenditure, revenue, exchange rate and inflation. To determine the direction of causality between public expenditure and public debt, granger causality test was conducted. Due to existence of four (4) cointegrating equations and non-stationarity of time series at levels, VECM was employed as the most suitable estimation technique. Significance of the model was determined through LM autocorrelation test, Jarque-Bera normality test and eigenvalues stability test.

5.2 Conclusion

The study sought to establish the nexus between public expenditure and public debt. Empirically, VECM results reveal that in the short run recurrent government expenditure negatively affects public debt while development government expenditure positively affect public debt. This is contrary to the findings of Odo et al., (2016) that both recurrent and development expenditure have a positive effect on public debt. The government does not borrow to finance recurrent

expenditure but rather for development purposes. Inflation on the other hand has a significant positive effect on public debt which is inconsistent with the findings of Belguith & Omrane (2016) and Swamy (2015).

Exchange rate affects public debt negatively while both election years and bicameral structure of government have a positive significant effect on public debt in the long run. Recurrent government expenditure and development government expenditure do not have a long run relationship with public debt. Granger causality test reveal that the direction of causality between public debt and development is bidirectional whereas the direction of causality between public debt and recurrent government expenditure is unidirectional running from public debt to recurrent government expenditure. Causality between recurrent government expenditure and development government expenditure is also bidirectional.

5.3 Policy Implication

The results reveal a significant positive and negative effect of development government expenditure and recurrent government expenditure on public debt in the short-run respectively. This means that an increase (decrease) in development government expenditure by one (1) unit will result to an increase (decrease) in public debt by 2.3 units. Policy makers should therefore ensure that the development expenditure is reduced to sustainable levels as well as used productively. If possible, priority should be given to infrastructural investments that will bear returns and thus the debt burden will not strain the economy. Recurrent expenditure has a negative effect on public debt, it will therefore be important for the policy makers to ensure that the recommended development expenditure to recurrent expenditure ratio of 30:70 is maintained throughout the Medium Term Expenditure Framework (MTEF) budget process.

Election years and bicameral structure of government have a positive effect on public debt in the long run, the government should therefore establish strong systems that will allow for free, fair and credible elections so as to reduce misappropriation of resources during the electioneering period. Further, the policy makers should take advantage of the awaited Building Bridges Initiative (BBI) recommendations to establish a sustainable government structure that will not be

an impediment to the envisaged growth prospects outlined in various national development agendas. Efforts should also be made to expand revenue base.

5.4 Limitation of the Study

The study focused on the nexus between public sector expenditure and public debt in Kenya for the period 1980-2018. The control variables were revenue, inflation, exchange rate, election years and structure of government. A similar study can be done by factoring in other control variables that may affect public debt but were not of interest to this study.

5.5 Areas for further Research

Future studies on public debt should include different control variables other than revenue, inflation, exchange rate, election years and structure of government that were used in this study. Further, different approaches like use of panel data or quarterly time series data may be explored. The same study can be done in the neighboring East African Countries for purposes of comparison and contribution to the available limited studies.

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APPENDICES

Appendix A: Correlation Matrix

	pdasaofgdp	rgeasaofgdp	dgeasaofgdp	revasaofgdp	inf	ex
Pdasaofgdp	1.000					
rgeasaofgdp	0.565* 0.000	1.000				
dgeasaofgdp	-0.062 0.707	0.377* 0.0179	1.000			
revasaofgdp	0.488* 0.002	0.861* 0.000	0.490* 0.001	1.000		
inf	0.161 0.328	0.202 0.218	0.005 0.979	0.237 0.149	1.000	
ex	-0.020 0.905	-0.560* 0.000	-0.448* 0.004	-0.480* 0.002	-0.138 0.402	1.000

Appendix B: Vector Error Correction Model Results

Sample: 1983 -2018

Number of Obs = 36

Log likelihood = -415.138

AIC = 33.285

Det (sigma_ml) = 1.434

HQIC = 36.110

SBIC = 41.379

Equation	Parms	RMSE	R-sq	chi2	p>chi2
D_pdasaofgdp	21	8.426	0.790	48.970	0.000
D_rgeasaofgdp	21	5.685	0.792	49.482	0.000
D_dgeasaofgdp	21	2.693	0.722	33.833	0.038
D_rveasaofgdp	21	4.541	0.722	33.509	0.041
D_inf	21	6.493	0.793	49.672	0.000
D_ex	21	6.311	0.545	15.584	0.793
D_d1	21	.289	0.927	163.940	0.000
D_d2	21	.175	0.542	15.384	0.803

	co-efficient	Std. Err.	z	p> z
D_pdasaofgdp				
_ce1	-1.601	.500	-3.22	0.001
L1.				
_ce2	4.738	1.971	2.40	0.016
L1.				
_ce3	-1.010	.687	-1.60	0.109
L1.				
_ce4	-3.546	1.672	-2.12	0.034

	co-efficient	Std. Err.	z	p> z
L1.				
pdasaofgdp				
LD	.359	.297	1.21	0.228
L2D	.254	.368	0.69	0.491
rgeasaofgdp				
LD	-2.460	1.489	-1.65	0.099
L2D	-1.472	.936	-1.57	0.116
dgeasaofgdp				
LD	1.619	1.076	1.50	0.133
L2D	2.268	1.000	2.63	0.009
rveasaofgdp				
LD	2.190	1.852	1.18	0.237
L2D	.814	1.148	0.71	0.478
inf				
LD	1.003	.393	2.55	0.011
L2D	-.195	.314	0.62	0.536
ex				
LD	.001	.520	0.00	0.998
L2D	.449	.724	0.62	0.535
d1				
LD	-.858	9.940	-0.09	0.931
L2D	-1.914	6.026	-0.32	0.751
d2				
LD	2.144	12.252	0.17	0.861
L2D	-14.149	11.275	-1.25	0.210
_cons	-.196	2.729	-0.07	0.943

Cointegrating equations

Equation	Parms	chi2	p>chi2
_ce1	4	65.890	0.000
_ce2	4	44.921	0.000
_ce3	4	72.125	0.000

_ce4	4	84.557	0.000
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Identification: beta is exactly identified; Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	p> z
_ce1				
pdasaofgdp	1	.	.	.
rgeasaofgdp	-1.78e-15	.	.	.
dgeasaofgdp	-3.89e-16	.	.	.
rveasaofgdp	1.78e-15	.	.	.
inf	2.052	1.471	1.40	4.935
ex	1.080	.266	4.06	1.602
d1	-276.285	38.541	-7.17	-200.745
d2	-41.081	23.768	-1.73	5.504
_cons	-17.402	.	.	.
_ce2				
pdasaofgdp	1.11e-16	.	.	.
rgeasaofgdp	1	.	.	.
dgeasaofgdp	-5.55e-17	.	.	.
rveasaofgdp	4.44e-16	.	.	.
inf	.330	.329	1.00	0.316
ex	.368	.060	6.18	0.000
d1	-10.349	8.634	-1.20	0.231
d2	-10.840	5.324	-2.04	0.042
_cons	-46.925	.	.	.
_ce3				
pdasaofgdp	-1.67e-16	.	.	.
rgeasaofgdp	0	(omitted)	.	.
dgeasaofgdp	1	.	.	.
rveasaofgdp	0	(omitted)	.	.
inf	-.598	.589	-1.01	0.310
ex	-.265	.107	-2.48	0.013
d1	126.260	15.446	8.17	0.000
d2	9.220	9.525	0.97	0.333
_cons	-34.486	.	.	.

beta	Coef.	Std. Err.	z	p> z
_ce4				
pdasofgdp	0	(omitted)		
rgeasaofgdp	0	(omitted)		
dgeasaofgdp	-1.53e-16	.	.	.
revasaofgdp	1	.	.	.
inf	-.029	.307	-0.09	0.926
ex	.027	.056	0.49	0.624
d1	71.738	8.046	8.92	0.000
d2	1.016	4.96189	0.20	0.838
_cons	-51.976	.	.	.