EFFECT OF PUBLIC DEBT ON ECONOMIC GROWTH IN KENYA

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DECLARATION

STUDENT'S DECLARATION

I GIDEON N. ACHWOGA declare that this is my original work and has not been presented for a degree in any other university.

Sign: …….. Date: ……

SUPERVISOR'S DECLARATION

This thesis has been submitted for examination with my approval as university supervisor

Dr. Christine N. Simiyu

Sign: ……..... Date: …….

DEDICATION

I dedicate this thesis to my family. I also dedicate it to the School of Business KCA University for being a strong pillar throughout my course. I have been deeply humbled by the knowledge acquired and support accorded to me during my studies at the university.

ACKNOWLEDGEMENT

I wish to thank The Almighty God for giving me a gift of life to write this work. I wish to express my gratitude to my supervisor for her professional guidance in research methodology and motivation that enabled me to compile this thesis. I also extend gratitude to my classmates whose presence offers me the psychological motivation and need to learn.

Finally, I thank my family for supporting me throughout all my studies from Primary school all through to university level. I can’t express my gratitude in words to my family, whose unconditional love and patience for being absent from their lives during my study time gave me great strength to complete this work.

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ABSTRACT

A developing country like Kenya compliments its revenue through public borrowing. The successive governments have always acquired huge sums of public debt to finance national development plans in Kenya. High levels of public debts have mixed effects on economic growth. This examines the effects of public debts on economic growth. Data spanning from 1963 to 2015 was used. The study sought to establish the effect of domestic and foreign public debt on economic growth in Kenya. A descriptive research design was applied. Secondary data obtained from World Bank Sources, Central Bank of Kenya, International financial statistics like the International monetary fund and Kenya National Bureau of Statistics was used for analysis. Data was analyzed using EVIEWS version 7.2. The findings indicated that economic growth is negatively and significantly related to external debt. The results indicated significant and negative associations between GDP and domestic debt. Multiple regression analysis indicated that economic growth is positively and significantly related to domestic debt. The association between debt service and GDP was positive but not significant. Other results also indicated that the association between debt service and GDP was positive and significant. Exchange rate had a negative and insignificant association with GDP. In light of the results and conclusions discussed in the foregoing paragraphs, the government and policymakers in Kenya should consider the following recommendations to improve public debt management. First, the governments should establish and adopt an optimal balance between external and domestic debt to maintain steady economic growth. Although domestic debt had no significant effect on GDP in the short run and a positive effect on GDP in the long run, it cannot be relied on entirely since a rapid increase in borrowing locally has the potential of crowding-out private investments. Second, the negative effect of exchange rate on economic growth is a signal to the central bank and Policy makers that they need to stabilize the local currencies for instance by improving exports. Since debt service causes exchange rate, proper management of debt service is hence a key priority for the government. The study also recommends that prudential fiscal management measures are required to avoid an unnecessary increase in overall public debt. A reduction in borrowing will enable the country to use a greater proportion of their tax revenues for investments rather than repaying loans, thereby increasing economic growth. Furthermore, real exchange depreciation raises the debt burden and negatively relates to GDP. There is thus the need to ensure that exchange is not over-devalued in order to balance two effects.

Key Words: External debt, Domestic debt, Public debt, Economic growth, Kenya

LIST OF ABBREVIATIONS

CBK	Central Bank of Kenya
DS	Domestic debt servicing
ECM	Error Correction Modeling
EDS	External debt servicing
EXR	Exchange rates
GDP	Gross Domestic Product
GNP	Gross National Product
HIPC	Highly indebted poor countries
HIPC	Highly Indebted Poor Countries
IMF	International Monetary Fund
OLS	Ordinary Least Squares
UNICEF	United Nations International Children's Emergency Fund
USA	United States of America
VAR	Vector Autoregressive model
VECM	Vector Error Correction Model

OPERATIONAL DEFINITION OF TERMS

Public Debt The debt owed by a central government. It includes both Domestic and External debt (Patenio and Tan-Cruz, 2007).

Domestic Debt Is a portion of a country's public debt owed to lenders within the country (Patenio and Tan-Cruz, 2007).

External debt Is a portion portion of a country's debt that was borrowed from foreign lenders including commercial banks, governments or international financial institutions (Patenio and Tan-Cruz, 2007).

Economic Growth An increase in the amount of goods and services produced per head of the population over a period of time. It is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another (Schclarek,2004).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Public debt is the total amount of money that the government has borrowed from any source (Patenio and Tan-Cruz (2007). It is the difference between what the national government spends and the revenue it receives during a particular year. So, each year's deficit is added to the existing debt (Munyigi, 2013).

According to Patenio and Tan-Cruz (2007), a public debt is a debt owed to both external and internal parties by a government of an independent country. External Public Debt is debt owed to external creditors which are multilateral creditors such as African Development Bank, World Bank, International Monetary Fund and bilateral creditors who are essentially governments of other countries and commercial creditors. Hence, public debt is categorized into two groups: Domestic (internal) and Foreign (External). Domestic debt is funds borrowed from sources within the country. According to Commonwealth secretariat, (1999), Public domestic debt is the debt which a government incurs by borrowing in its own currency from the residents of its own country. This type of debt is raised by selling securities, government bonds and bills while External debt is funds borrowed from foreign lenders, this can include private sources, other countries and the International monetary fund.

The effect of Public debt on economic growth remains a key area of interest. Every country is striving to have sustainable economic development. According to Reinhart and Rogoff, (2011), the greatest hindrance to sustainable development is fiscal deficits mainly driven by public debt servicing and widening current account deficits.

1.1.1 Public debts in advanced countries

International Monetary Fund (2010) report stated that most of the European countries experienced external public debt in excess of 100% of GDP by 2010. Before the onset of the 2008 financial crisis, public debt of the Euro zone countries was about 70% of GDP on average; this was 10% higher than in the early 1990s. Since 2007, debt ratio has increased by 10% to 60% of GDP. This increase caused countries like Spain, Portugal, Ireland and Greece experience severe difficulties in refinancing their debts.

According to International Monetary Fund (2012), the close of financial year 2012 found many economies still weighed down by high debt burdens across multiple sectors. The overall outlook remained fragile. According to World Economic Outlook (2012), the global growth dropped from about 4 percent in 2011 to 3½ percent in 2012. The euro area was projected to go into a mild recession in 2012 as a result of the sovereign debt crisis, the effects of bank deleveraging on the real economy, and the impact of fiscal consolidation. In the advanced economies as a group, output was expected to expand by only 1½ percent in 2012 in Japan and United States. Job creation in these economies would, it was thought, remain sluggish, and unemployment was expected to remain near 8 percent. The report further links this to the growing public debts. The euro area debt crisis continued undermined financial market stability and remained the single biggest source of risk to the world economy.

Aghion and Kharoubi (2007) and Abbas (2010) noted that the financial crises of 2008 promoted an unprecedented and contagious public debt crisis in Europe which is still unfolding .The crisis brought the most rapid increase in global government debt since World War II. International Monetary Fund (IMF 2010) noted that between 2007 and 2011 net government debt as percentage of GDP rose from 51% to 70% in the Euro area

and from 42% to 73% in the USA, 38% to 74% in the UK and 82% to 130% in Japan. Before the onset of 20th century, the accumulation of large stocks of public debt was generally slow and occurred mainly due to wars.

The high negative effects as a result of increased public debts need strong and urgent sustainable fiscal consolidation plans over the medium term that would put public debt on a clear sustainable path, particularly in Japan and the United States. The IMF (2012) report further states that Medium-term fiscal plans needed to involve strengthening fiscal institutions and reforming entitlement programs, for example, linking retirement age to life expectancy or improving cost incentives in the health care sector. Articulating plans to tackle these issues would demonstrate policymakers' willingness and ability to act, thereby helping to rebuild market confidence in the sustainability of public finances early in the process.

1.1.2 Public debts in emerging and developing countries

In emerging market and developing economies, real gross domestic product (GDP) growth slowed slightly to 5¾ percent in 2012, from 6.2 percent in 2011(International Monetary Fund,2012) ,thanks to domestic vulnerabilities which had been gradually building for a decade supported by rapid credit growth.

IMF (2011) reported that the debt crisis of sub Saharan and other developing countries increased rapidly following the global debt crisis that emerged in the early 1980s. The crisis led to over-borrowing by most developing African countries and increased lending by the international banks in the same period. The collapse of the world commodity prices especially petroleum also escalated the debt situation in those countries. The increase in foreign borrowing that followed the debt crisis was worsened

by the oil price shocks of 1973 and 1979. The oil price shock resulted in acute current account deficits in most non-oil producing developing countries.

IMF (2012) report reflected the effects of the increased debts in developing countries showing in the 1980s per capita income of sub-Saharan Africa which declined at an annual average rate of 2.2% while per capita private consumption went down by 14.8%. During the same period, the volumes of export were 4.3% while terms of trade fell by 9.1%. Between 1981 and 1990 the GDP growth of these countries was 1.7% in average. The decline in growth rate of Sub-Saharan Africa to negative -0.9% is a sharp contrast with East Asia's real per capita GDP growth rate of 6.3% and China's impressive growth rate of 8.2% during the same period. With the build-up of external debt and poor economic performance of SSA economies, the debt problem has risen to significant levels and the burden has become even worse.

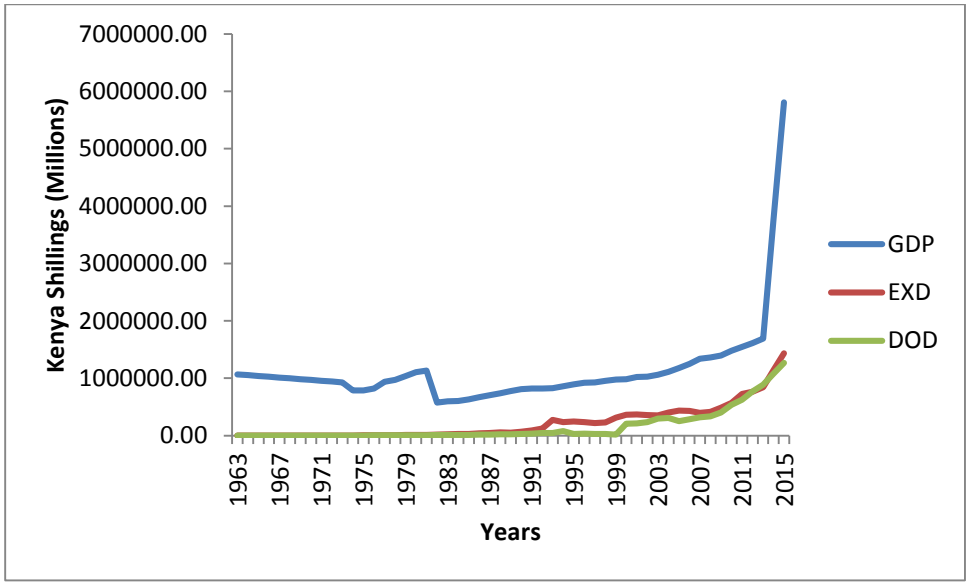
According to the report published by IMF (2013), Tanzania is ranked third as the most indebted countries in Eastern Africa. It comes after Kenya and Burundi while Uganda is fourth. Rwanda has the lowest public debt among the five countries with 22%.Similarly Kenya is ranked second with 28.5% foreign debt service while Burundi is leading with 50%.

1.1.3 **Trend analysis of Kenya's public Debt to real GDP** (1963 to 2015)

Statistics compiled by IMF (2013), places Kenya among the east African countries in the second position as the most indebted country with 53% of public debt against GDP, after Burundi which has 72.3% . In position three is Tanzania while Uganda is fourth with 34% and 27% respectively. Rwanda has the lowest public debt among the five countries with 22%. IMF (2013) also indicates that in terms of debt service, Burundi is ahead of Kenya with 50% while Kenya has 28.5% debt service (IMF, 2013).

In Kenya, public debt is used to industrialize and also to develop infrastructure (Were, 2010). The assumption is that, if these conditions are improved, the economy will grow and be able to finance such debts. World Bank (2010) report indicates that difficulties in management and servicing of debts exists among the Highly Indebted Poor Countries (HIPCs) even though they have been servicing. In the Kenyan context, Public debt (External and Domestic) have been rising steadily from 1963 to 2015 as shown in Figure 1.1.

Figure 1.1: Kenya's Public debt in relation to real GDP (1963-2015)



Source: World Bank Data (2015)

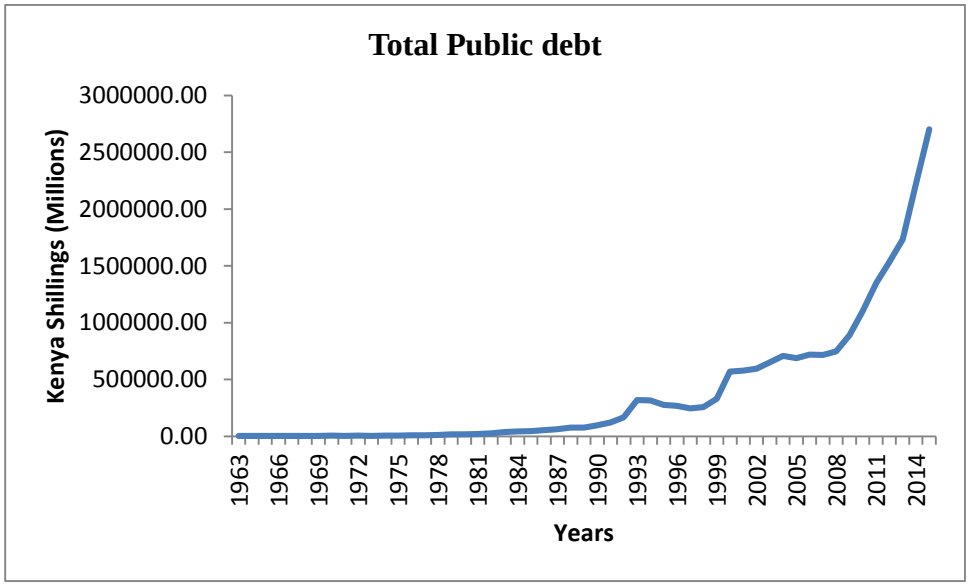
According to Figure 1.1, public debt has been rising steadily. The external and domestic debts have been rising but under manageable amounts until 1993 when the rise became steadier. The figure indicates that in the period between 1963-1990, domestic debt did not exceed the external debt and this clearly shows that domestic debt crisis was not an issue of concern by then. This was due to good economic performance, as shown by the real GDP, external inflows were large due to cold war and that there also prevailed good economic and political stability in the country. During this period domestic debt

were manageable and stable since the real GDP is good enough to cover the budget estimates. The 1983 Economic Survey had observed that as the government was responding to the increased pressure on government finances and need to finance large balance of payment deficits, public debt had been increasing. Most of this increase was due to the rapid escalation in the size of external debt. External public debt increased at 33.5 per cent in 1982 alone. Internal public debt increase was much more moderate at 3.8 per cent that same year.

The next decade up to 2000, saw the domestic debt increase at an increasing rate and even forming a larger portion of the public debt burden. Whereas the real GDP was not steady, the trend in the domestic debt was increasing. Much increase in domestic debt is noted during the last twelve years period 2001-2012, it is now approaching a trillion. In the earlier years that is 1981 to 1984 real GDP is seen to decrease with the increase in domestic debt after which the economic growth is seen to increase with the increase in domestic debt and thereafter decreases with the increase in domestic debt to its lowest point of actually less than one in year 2000. The economy did so well between years 2003 to 2007 with a significant growth in domestic debt, declined in year 2008, and thereafter picked, still with much growth in the domestic debts.

The trend of public debt in Kenya kept rising. As at April 2010, Kenya's debt burden had reached Kshs. 1.19 trillion translating to each of the 40 million Kenyans owing foreign and domestic creditor's Kshs. 29,750 which is more than the take home salary of many workers (Were, 2011).

Figure 1.2: Kenya's Public debts trends (1963-2015)



Source: World Bank (2015)

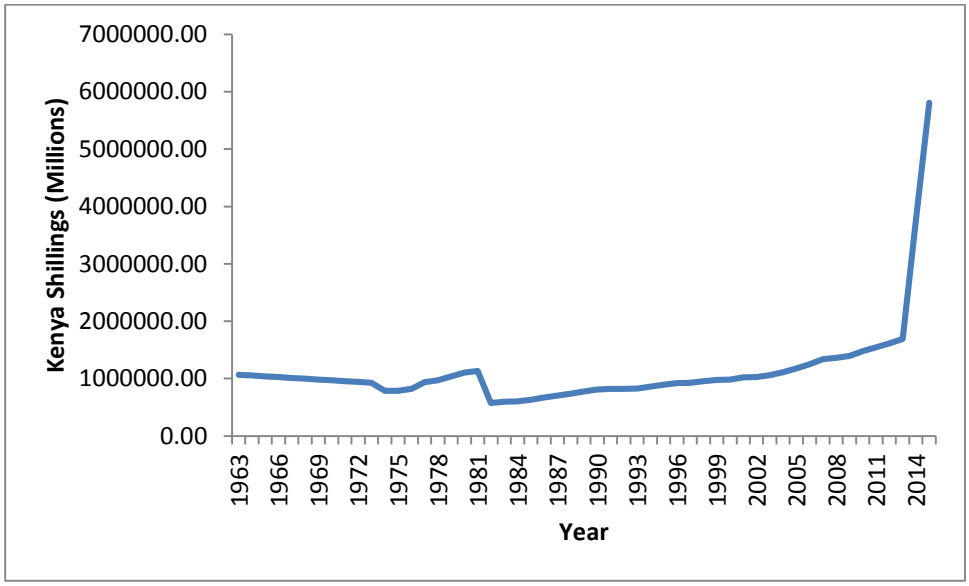
The results in Figure 1.2 confirm the previous trends in Figure 1.1 that the public debt has been experiencing increasing trends since 1963. In the period between 1963 and 1990, the trend was gradual but after 1990, the trend was steady. As at June 2013, Kenya was reported to have a debt to gross domestic product (GDP) ratio that is higher than the internationally accepted standard of 45 percent. At the current debt levels Kenya is reeling from high costs of servicing both domestic and foreign debt, a situation that is slowly pushing borrowing to unsustainable levels and is likely to stoke interest rates. The current debt level of 48.9 percent of GDP is unsustainable (National Treasury, 2013). The upward trends in public debts is worrying, and as various studies report conflicting effects of public debts on economic growth. This study aimed to establish the relationship pertaining to the Kenyan economy.

1.1.4 Trend analysis of Kenya's Economic growth

Kenyan economy has posted a mixture of patterns in terms of growth in real Gross Domestic Product (GDP) as depicted by peaks and trough since independence. Kenya

recorded an average growth rate of 6.5% in real GDP over the period 1964-1967 which was exceptional considering that Kenya is a developing country (CBK 2002). However, this growth momentum was slowed down by the first oil crisis of 1972 and as a result GDP growth rate decelerated to below 4 percent during the early 1970s. Following the unexpected coffee boom of 1976 and 1977, GDP growth rate averaged 8.2% (GOK, 1994).

Figure 1.3: Kenya's economic growth (1963-2015)



Source: World Bank Data (2015)

During the most early 1980's, GDP growth rate remained below 5 percent and fell to below 1 percent in 1984. This was largely attributed to severe drought of that year. Agriculture was the most affected; its contribution to GDP fell to -3.9 percent. However, there was an economic recovery in 1985-1986 when growth rate 4.8 percent and 5.5 percent respectively were recorded. This was attributed to favorable weather conditions, government budgeting discipline and improved managerial principle (GOK, 1994). GDP growth rate continued to slide in the 1990's falling to 0.2 percent in 1993. Dismal performance of the economy during this period was attributed to decline in real output

and value added in agriculture due to below average amount of rainfall; sluggish growth in aggregate private domestic demand and foreign exchange shortages leading to reduced imports of intermediate goods as well as suspension of donor aid (GOK, 1994)

After the economy registered a disappointing performance in the 1990's and early 2000, it resumed growth momentum again and there was a consistent increase in GDP growth rate from year 2002. The economy grew at a rate of 7.0 percent in 2007. However, this growth momentum was slowed by post-election violence of 2008, and the economy grew at a rate of 1.7 percent.

1.2 Statement of the Problem

According to CBK (2012), Public debt in Kenya has been on upward trend especially for the last ten years. In 2010, the country's total public debt amounted to Kshs.1.2 trillion with a major shift towards the domestic debts (Maana, Owino & Mutai, 2008). High domestic debts affect both private investment and economic growth because it induces uncertainty and negatively affects investments via high interest rates which reduce investments and consequently slows down economic growth. Domestic borrowing in Kenya crowds out private sector (Maana, Owino & Mutai, 2008). Increased domestic debt also reduces the country's credit-worthiness hence scaring potential investors and foreign lenders (Maana, Owino & Mutai, 2008).

The link between public debts and its effect on economic growth has not been explicitly brought out in the literature. Debates on this relationship between public debts and economic growth have continued to yield inconsistent results. Some studies present a negative effect of public debts on economic growth. For example studies by Ribeiro, Vaicekauskas and lakštutiene (2012**);** Shah and pervin (2010); Reinhart and Rogoff (2010); Kumar and Woo (2010); Chironga (2003). Other studies present a positive effect of public debts on economic growth. For example studies by Degefe (1992); Gikandu

(2012). Other studies did not find any relationship between public debts and economic growth. For example studies by Were (2001) and Schclarek (2004). The recent increase in public debt across developing countries including Kenya, during and after the recent global crisis has made it a prominent policy issue of whether high debt levels have a negative impact on growth.

Furthermore, studies conducted on public debts and economic growth have presented contextual, conceptual and methodological research gaps. A study by Kumar and Woo (2010) using panel data regressed per capita GDP growth against lagged values of the debt – GDP ratio so as to establish the causality concept. The study however presented a conceptual research gap by using lagged values of debt. Further, the study presented contextual research gaps as it was conducted in a different context from the current study. In another study, Shah and Pervin (2010) used an Ordinary Least Squares regression method to investigate effects of external public debt on economic growth of Bangladesh economies. The study was conducted in Bangladesh economies thus presenting a contextual gap. The study also focused on external public debt only and that presents a conceptual research gap as the current study focused on both external and domestic debts. Furthermore, the use of OLS presents a methodological research gap as the current study used a VAR model. Furthermore a study by Ullah (2011) using cointegration technique to examine the impact of foreign aid on economic growth in Pakistan presented conceptual, contextual and methodological research gap. In Kenya, Gikandu (2012) did a study on the relationship between domestic debt and economic growth in Kenya. The study similarly presented a conceptual research gap as it focused on domestic debts only. These are the research gaps which motivated the current study to be conducted.

Many of the past studies were done on developed and emerging economies. This study was conducted in a developing country, Kenya. It established what effect the external and internal debt levels in the Kenyan economy have on economic growth because as noted in the trends, the Kenyan Public debt trends have been rising at a rate different from economic growth.

1.3 Objective of the Study

1.3.1 General Objective

The purpose of this study was to establish the effects of public debts on economic growth in Kenya.

1.3.2 Specific Objectives

1. To assess the effect of external (foreign) public debt on economic growth in Kenya.
2. To determine the effect of internal (domestic) public debt on economic growth in Kenya.
3. To determine the effect of total public debt servicing on economic growth in Kenya.
4. To estimate the effect of exchange rate as a control variable on economic growth in Kenya.

1.4 Research Question

In view of the above, this research sought to answer the following questions:

1. What is the effect of external (foreign) public debt on economic growth in Kenya?
2. What is the effect of internal (domestic) public debt on economic growth in Kenya?
3. How does public debt servicing affect economic growth in Kenya?
4. What is the effect of exchange rate as a control variable on economic growth in Kenya?

1.5 Significance of the Study

The results obtained from the study are expected be useful to the government policy makers and various stakeholders in the ministry of Finance in highlighting the various implications of public debts in economic growth in the country. The study comes up with findings that can assist policy makersin understanding the effects of public debt on economic growth hence put in place effective measures to enhance the nation's economic growth and stability. The findings are expected to be vital in informing policy makers on the appropriate and optimal debt mix for the purpose of achieving better economic outcomes.

The study also adds to the existing literature on the impact of public debts on the economic growth of the country and also provide some recommendation on the various ways of mitigating the impact. The study sought to contribute to the body of knowledge, while at the same time, deepening research gaps on effects of public debt on economic growth that other scholars may need to undertake in future.

1.6 Scope of the Study

The main objective of this study is to examine the effects of public debts on economic growth in Kenya. Particularly, the question of interest is whether there is any significant effect of external debt and domestic debt on economic growth in Kenya. The study used time series data to analyse public debts trends in Kenya compared to GDP growth rate from the year 1963 to 2015.

1.7 Limitations of the study

The study was limited in its applicability to economic growth in the Kenyan economy since in reality there are more than the enumerated variables that determine Economic growth of a country. The time period in consideration, 1963 to 2015 is a constraint to getting a more robust view of the effects of public debt on economic growth.

Perhaps using a longer time period would have yield different trends and results. But due to limited time and resources as well as availability of data, the study was limited to the specified time period.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter outlines literature review on public debt and its effect on economic growth. Both theoretical and empirical literature is discussed and at the end of the chapter an overview of literature is given.

2.2 Theoretical Overview

2.2.1 Dependency theory

The interaction between the developing and developed nations is captured by the theory. According to the theory, poor states are impoverished and rich ones enriched by the way poor states are integrated into the "world system". The theory originates with two papers published in 1949 – one by Hans Singer and another one by Raúl Prebisch. Matias (2004) stated that theory has its roots from the Marxian perspective in what was seen as a direct challenge of the market economic policies adopted in the post-war era which advocated a free market. Although painful for a time, some of the methods of market liberalization will in the long run help these nations to establish their economies making them competitive at the global level.

According to the theory, the developed world perpetuated dependence through various means which did not end when independence was attained. It has been posited that this involves media control, politics, banking and finance, education (which translates to all aspects of human resource development) and sport. Domination by the developed world has continued through the great influence of transnational companies. Supporters of the dependency theory propose that only through the delinking by the developing countries from the developed world would we have development seen in these countries. The wealthy nations counter attempts by dependent nations to resist influence and

actively keep developing nations in a subservient position often through economic sanctions or by proscribing free trade policies attached to loans granted by the World Bank or International Monetary Fund.

The dependency theory also suggests that dependency increases as the developed and developing world continue to interact in the world market system because of how they are integrated into the system. Wealthy countries use their wealth to influence the adoption of policies that increase wealth of the developed nations at the expense of the developing nations. This causes a situation where capital moves to the developed nations but not developing nations. This causes a situation where capital moves to the developed nations, which forces the latter to seek larger loans which further indebts them further.

2.2.2 Dynamic Theory of Public Spending, Taxation, and Debt

The theory builds on the well-known tax smoothing approach to fiscal policy pioneered by Barro (1979). The approach predicts that in order to sharp changes in tax rates, the government use budget surpluses. In times of high expenditure needs, the government runs deficits but runs surpluses in times of low expenditure needs. The theory however assumes fluctuations in government expenditure as well as a convex function between costs of income tax and tax rate.

The theory further argues that issuance of bonds going for one period is what constitutes borrowing. Bonds can be purchased and the interest earned from them is used to finance government expenditure. Pork-barrel spending can also be achieved when the provision of a public good which is of benefit to all citizens is financed by public revenues. The level of public debt acts as a state variable, creating a dynamic linkage across policy-making periods.

2.2.3 The Debt Overhang Theory

The debt overhang theory is based on the premise that if the total amount of debt exceeds the country's repayment ability in the future, then the expected debt service of that country will be an increasing function of its output level. This implies that part of the returns gained from investing in the domestic market is taken by the foreign creditors thus discouraging domestic investments (Claessens, 1996). In such a situation the indebted country is left with a small proportion of any increases in output and exports because part of the proceeds is used to service external debt.

The theory postulates that reducing debt obligation lead to a rise in investment and repayment capacity. When this happens, the outstanding debt is more likely to be repaid therefore reducing chances of debt default. Similarly when the effect is strong, the indebted country is said to be on the wrong side of the debt Laffer curve. Laffer describes the relationship between the level of debt and the country's repayment ability which implies that there is a maximum at which accumulation of debt promotes growth (Elbadawi, 1996). Therefore the debt overhang hypothesis predicts that, if there is likelihood that in future, debt will be larger than the country's repayment ability, then the cost of servicing the debt will depress further domestic and foreign investment (Krugman, 1988; Sachs, 1990).

Baum, Anja, Cristina and Philipp (2013) states that there is a negative relationship between economic growth and public debt by arguing that high levels of indebtedness discourage investment and negatively affect growth as future tax revenues go to repay debt. Kenya has been experiencing rapid external debts growth over the years. Some of this debt is over 50 years old with less prospects of full service and to service, the

government resorts to borrowing domestically to service the external debt thus worsening the case.

2.2.4 The Crowding out effect Theory

Olivier (2008) argues that crowding out occurs when increased government involvement in a sector of the market economy substantially affects the remainder of the market, either on the supply or demand side of the market. Once the government borrows heavily from the domestic market, a shortage of funds arises prompted by increased demand for investible funds which drives interest rates up leading to the reduction of private borrowing and hence limiting private investment (Maana, Owino & Mutai, 2008).

Michael (2011) argues that the macroeconomic environment determines the extent of crowding out effect. Economic situation controls the extent of crowding out. If the economy is at capacity or full employment, then the government suddenly increasing its budget deficit (e.g., via stimulus programs) could create competition with the private sector for scarce funds available for investment, resulting in an increase in interest rates and reduced private investment or consumption. Thus the effect of the stimulus is offset by the effect of crowding out. On the other hand, if the economy is below capacity and there is a surplus of funds available for investment, an increase in the government's deficit does not result in competition with the private sector. In this scenario, the stimulus program would be much more effective. In sum, changing the government's budget deficit has a stronger impact on GDP when the economy is below capacity.

2.5 Empirical literature review

Different scholars and researchers have reviewed the effect of public debt on economic growth. Various theoretical and empirical works have tried to explain the relationship between public debts and economic growth. The empirical literature review has been done in line with the study objectives.

2.5.1 External public debt and economic growth

A study by Reinhart and Rogoff (2010 and 2012) showed that high levels of external public debt are negatively correlated with economic growth, but that there is no link between debt and growth when public debt is below 90% of GDP.

Mustafa (2010) conducted a study to find out the impacts of public debt on economic growth in Pakistan economy. Both short run and long run effects were established using cointegration method. The findings showed both long run and short run significant effect of external debt on economic growth while labor force negatively affects GNP in both short and long run. Similarly; Ullah (2011) using Trace and Eigen statistics also established a long run relationship between aid and economic growth in Pakistan.

In the Bangladeshian context, Shah and pervin (2010) conducted a study to find out whether there was a short and long run relationship between external public debt and economic growth using an OLS regression model and the findings revealed that in the long run, external debt service has a negative effect on GDP while in the short run external debt has a positive impact on GDP. Evidence of debt overhang was not established. The study left behind a number of gaps. The study was conducted in Bangladesh economies thus presenting a contextual gap. The study also used OLS thus presenting a methodological research gap.

A study by Reinhart and Rogoff (2010) concluded that high levels of public debt in relation to GDP of over 90% is accompanied by a lower levels of economic growth in both developed and developing countries. Consequently, in the case of developing countries external debt levels of over 60% of GDP negatively affects economic growth Kumar and Woo (2010) concluded that there is an inverse relationship between initial debt and the subsequent growth. They argued that an increase in 10% in

the initial debt –GDP ratio leads to a decrease in annual real per capital GDP growth of 0.2% points per year.

2.5.2 Domestic public debt and economic growth

A study by Patillo, Romer and Weil (2004) concluded that at low levels of domestic debt affects economic growth positively, while at high levels, this relationship becomes negative. The study had contrasting results from the study by Schclarek (2004) which used a panel including 59 developing and 24 industrialized countries and found out that for the developing countries, there is always a negative and significant relationship between domestic debt and economic growth.

In another study, Chironga (2003) examined the structure, magnitude, level, and determinants of public domestic debt in Kenya for the period 1990-2001. This study further examined the trend and impact of domestic debt directly on the economic growth. The study employed the use of time series data for the period 1990 to 2001. The study concluded that there is a negative relationship between domestic debts and economic growth. The study however did not consider external debts in the analysis. That presented a conceptual gap. The study did also not consider both long run and short run effect thus presenting a conceptual gap.

Gikandu (2012) used Spearman rank correlation and descriptive statistics to establish whether domestic debt related to economic growth in Kenya and found that there existed a weak positive relationship between the two variables meaning that the use of domestic debt has some slight contribution to economic growth.

2.5.3 Public debt service and economic growth

Public debts in low income countries have significant effects on government budget, macroeconomic stability, private sector lending and ultimately growth

performance (Christensen, 2005). UNICEF (2000) argues that debt is killing children. Countries are diverting resources away from special provisions to repay debt; those most affected are the poor, especially women and children. UNICEF (2000) attributed the loss of 30,000 children each day due to poverty as government debt related.

In the Kenyan context, a study by were (2001) focusing on Heavily Indebted Poor Countries (HIPC) found no adverse impact of debt servicing on economic growth but proved some crowding-out effects on private investment. Another study by Schclarek (2004) found no evidence of external debt servicing on total factor productivity but a negative relationship with economic growth.

Makau (2008) established the relationship between external public debt servicing and economic growth in Kenya using both OLS and error correction modeling. The empirical results in the short run estimated model indicated that the coefficients of external debt to GDP had the correct sign and significant. In the long run estimated model, the coefficients of debt to GDP were significant.

Kibui (2009) used time series data between the years (1970-2007) to investigate the impact of external debt on public investment and economic growth in Kenya. It used reduced form growth model augmented with debt variables to examine the impact of external debt on public investments and economic growth in Kenya. The Empirical results indicated that public investment has a negative relationship with both the stock of external debt expressed as a percentage of GDP and debt service ratios. The results indicate that debt relief could act as a catalyst for investment recovery and economic growth in Kenya.

2.5.4 Exchange rate and economic growth

A study by Polodoo et al (2007) investigated the impact of exchange rate volatility on macroeconomic performance in small island developing states. He used yearly panel data spanning 1999 to 2010 and compute z-score to measure the exchange rate volatility. Plain panel ordinary least square regression was carried out with robust standard error to correct for heteroskedesticity. The result revealed that exchange rate volatility positively impacts on economic growth.

Investigation of the impact of exchange rate volatility on economic growth on small open economies at the European Monetary Unity (EMU) periphery was conducted by Schnabl (2007). He estimated a panel data of 41 countries in the EMU periphery from 1994 to 2005. Volatility was captured as a yearly average of monthly percentage exchange rate. He performed both GLS and GMM and the result provided evidence that exchange rate volatility has negative impact on economic growth. The study concludes that macroeconomic stability is necessary to maintain the peg since stable exchange rate positively influences economic growth.

Panel estimations for more than 180 countries Edwards and Levy Yeyati (2003) found evidence that countries with more flexible exchange rate grow faster. Eichengreen and Lablang (2003) found strong negative relationship between exchange rate stability and growth for 12 countries over a period of 120 years. Azid et al (2005) studied the impact of exchange rate volatility on growth and economic performance for Pakistan for the period 1973 to 2003. The study used GARCH estimation for exchange rate volatility. Johansen's multivariate co integration technique was used to capture both the short and long run dynamics in the study. Even after treating the volatility measure as either a stationary or non-stationary variable in the VAR, they were

not able to find evidence suggesting that economic growth is affected by exchange rate volatility. However, the result would have been biased. This is because the treatment of volatility as either stationary or non-stationary is not realistic since volatility is characterized by clustering of large shocks to conditional variance.

Azee et al (2012) examined the effects of exchange rate volatility on macroeconomic performance in Nigeria for a period of 25 years ranging from 1986 to 2010. The study employed OLS and Johansen co integration estimation technique to test for the short and long run effect respectively. The ADF test reveals that all the variables were stationary. The result found that the RER volatility contributes positively to GDP in the long run. Mauna and Reza (2001) studies the effect of trade liberalization, real exchange rate and trade diversification on selected North Africa countries Morocco, Algeria and Tunisia. By decomposing in real exchange rate into fundamental and monetary determinants, and by using both standard statistical measures of exchange rate fluctuation and the measures of exchange rate risk developed by Puree and Steinher (1989), they reached the conclusion that exchange rate depreciation has a positive effect on the quantity or manufactured exports while exchange rate misalignment, volatility or fluctuation has a negative effect. According to them, the motivating result is that all manufacturing sub-sectors are responsive to exchange rate change but the degree of responsiveness differs across sectors.

2.6 Overview of Literature

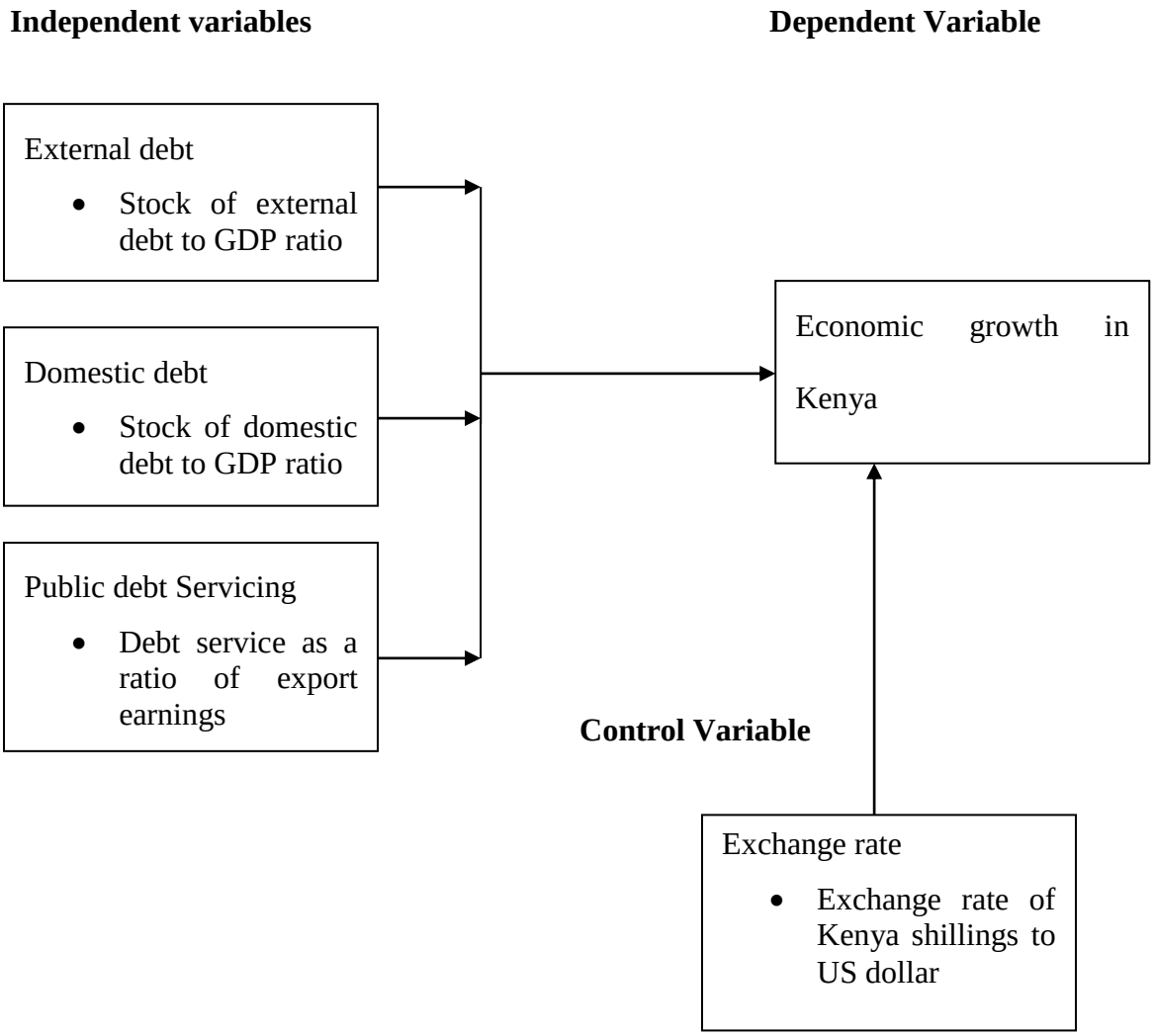
The link between public debts and its effect on economic growth has not been explicitly brought out in the literature. Some studies present a negative effect of public debts on economic growth. For example studies by Ribeiro, Vaicekauskas and lakštutiene (2012**) ;** Shah and pervin (2010) ; Reinhart and Rogoff (2010) ; Kumar and Woo (2010) ; Chironga (2003). While Other studies present a positive effect of public debts on

economic growth. For example studies by Degefe (1992) ; Gikandu (2012). Other studies did not find any relationship between public debts and economic growth. For example studies by Were (2001) and Schclarek (2004). The studies also presented a number of gaps which the current study sought to fill. Some studies, for example, Ribeiro, Vaicekauskas and lakštutiene (2012); Mustafa (2010); Ullah (2011); Shah and pervin (2010) presented contextual gaps since they were conducted in different contexts from the current study. Other studies, for example Ribeiro, Vaicekauskas and lakštutiene (2012) and Kumar and Woo (2010) presented conceptual gaps since they investigated variable not exactly similar to the variables under the current study; others, for example Ribeiro, Vaicekauskas and lakštutiene (2012 presented methodological gaps by using different methodology for analysis as compared to the current study. The current study sought to fill these gaps.

2.7 Conceptual Framework

The study investigates the effect of foreign public debt, domestic public debt and total public debt on economic growth in Kenya. The conceptual framework shows the link between the independent and dependent variable. A control variable affects the direction and/or strength of the relationship between an independent and a dependent variable. The control variable in this study was foreign exchange rates.

Figure 2.1 Conceptual Framework



2.8 Operationalization of the study variables

Operationalization refers to the measurement of variables. The section presents operationalization of the study variables. All the variables including the dependent variable were measured as indicated in the Table below.

Table 2.1 Operationalization of the study variables

Variable	**Measurement**
Economic growth	Amount of GDP (Kenya Shillings Millions)
External debt	Stock of external debt (Kenya Shillings Millions)
Domestic debt	Stock of domestic debt (Kenya Shillings Millions)
Debt service	Total Debt service (Current, in US Dollars)
REER	Annual exchange rate (Kenya shilling to US dollar)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology that was used to collect data for the study. It covers the research design, data collection procedure and data analysis methods.

3.2 Research Design

The study adopted a descriptive study design which is conducted to describe the present situation, what people currently believe, what people are doing at the moment and so forth (Baumgartner, Strong & Hensley, 2002). The major purpose of descriptive research design is description of the state of affairs as it exists at present (Kothari, 2004). The current situation in Kenya is existence of escalating public debts. It is important to investigate what is the relationship between this debt and economic growth. A descriptive research design answers the `what', `which' and `when' research questions. Therefore, the research design guided the current study in answering the `what' question of the relationship between public debts and economy growth in the Kenyan context.

3.3 Data Collection Instruments

This study analyzed secondary data to investigate and establish the effects of public debts on economic growth in Kenya. Secondary data involves the collection and analysis of published material and information from sources such as annual reports, published data research centers and libraries. This study collected annual data on external debt, domestic debt, debt service and exchange rate. Only relevant data that would meet the objectives of the study were sought. A secondary data collection template was used to collect data (Appendix I).

3.4 Data Collection Procedure

The study used time series data collected yearly from 1963 to 2015. The researcher obtained an authorization letter from the University and present it to the relevant authorities when collecting data. Data was collected from Kenya National Bureau of statistics, Central bank of Kenya, World Bank and International monetary fund. Data is collected on an annual basis. A secondary data collection template was used for data collection (Appendix I).

3.5 Exploratory of Data analysis

3.5.1 Trend Analysis

The study conducted trend analysis to review the behavior of the variables over time since 1963 to 2015. Line graph was used.

3.5.2 Descriptive

Descriptive statistics was also conducted to establish the measures of central tendency (Mean, median) , measures of variation (Standard deviation) normality of the variables using Jarque Bera test. Descriptive method reviewed descriptive statistics such as mean, medium, standard deviation and normality probability distributions carried out through skewness and kurtosis. The test combines both the Skewness and Kurtosis to test for normality.

For a normally distributed variable the asymptotic coefficient will be equal to zero, any JB test value that is not zero is thus a deviation from the normality assumption. Likewise Skewness coefficient for a normally distributed variable is zero while that of kurtosis is three. Deviations from normality assumption necessities transformation of all or some variables into logarithms, which has the effect of instilling normality (Agrawal et

al., 2010). The null hypothesis under this test is that the data is not statistically different from a normal distribution.

3.5.3 Correlation Matrix

The study used correlation analysis to investigate the association between the independent and the dependent variables as well as presence of Multicollinearity between the predictor variables. Multicollinearity occurs if two or more independent variables are highly correlated with one another. Multicollinearity is said to exist between two variables if they have a Pearson correlation value greater than 0.8 (Williams, 2008).

3.6 Multiple Regression Model

The study conducted a multiple regression model and diagnostic analysis from the results so as to evaluate if the multiple regression model was sufficient for the data set. Previous studies for instance, Reinhart and Rogoff (2010 and 2012), Mustafa (2010), Shah and Pervin (2010) as well as Makau (2008) have used ordinary least square regression model to link public debt and economic growth.

3.7 Post Multiple Regression Model Estimation Tests

After running the regression model, post estimation tests were conducted on the residual to check whether they did not violate the assumptions of OLS.

3.7.1 Heteroskedasticity

Assumptions of OLS stipulate that the residuals should be constant across time (Homoskedastic). Heteroskedasticity occurs when the variances of the error terms are not constant. The variances of the estimated estimators are not the minimum variances. This test was carried out to ascertain whether using regression model in OLS was sufficient to the set of data in this study.

3.7.2 Autocorrelation Test

Another assumption of OLS is that the residuals should not be correlated with one another over time. If the residuals are correlated over time, then there is a problem of serial correlation or first order autocorrelation. The consequences of autocorrelation are the same as those of heteroskedascity (Brooks, 2008). Serial correlation test was performed to ascertain whether using regression model in OLS was sufficient to the set of data in this study.

3.7.3 Residual Normality Test

Another assumption of OLS is that the residuals of a multiple regression model should be normally distributed. A normality test was conducted using both graphical and Jarque Bera test. The test for normality was first examined using the graphical method and further done using the Jarque-Bera test which is a more conclusive test than the graphical inspection approach of testing for normality.

3.7.4 Residual Plots

Residual analysis of the error term after the multiple regression model was also conducted to evaluate the goodness of the fit of the fitted regression model (Greene, 2002). If the graph of fitted versus residuals form a pattern, it is an indication that the regression model might not be a good fit; this test was performed to evaluate the goodness of the fitted regression model.

3.8 Time Series Models

The post regression analysis tests conducted on the multiple regression model indicated its unsuitability to be applied in the current study. The study hence opted for another time series model. Prior to running the time series model, preliminary tests were also conducted.

3.9 Preliminary Tests

3.9.1 Test for Stationarity

Non Stationarity has always been regarded as a problem in the analysis of time series data. Time series data is stationary if its mean, variance and covariance do not vary overtime. Non-stationary data leads to spurious regression due to non-constant mean and variance (Dimitrova, 2005). Differencing a series using differencing operators produces other set of observations. Data that is differenced once is given as:

$$\Delta X_t = X_t - X_{t-1.}$$

A series which is stationary without any differencing, is said to be I(0) or integrated of order 0. However, a series which is stationary after first-difference is said to be I(1) or integrated of order 1. After the stationarity of the series has been established, a test for the existence of a unit root if any (moment of the series: independence of mean, mode and kurtosis over time) in the variables is carried out by the use of Augmented Dickey-Fuller (ADF) test.

3.9.2 Lag length selection procedure

Before the Johansen cointegration test is performed, the optimal lag length for analysis should be identified (Simiyu, 2015). The lag length can be selected using the information selection criteria which include: Sequential Modified Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC) and Hannan-Quinn Information Criterion (HQIC) and ensuring that the residuals are white noise as suggested by Ivanov et al (2005). According to Simiyu (2015), there is no clear rule of thumb on which criterion to use for optimal lag length selection among the above methods. However, the decision rule is to choose the model with lowest value of information criteria.

The lag length for the VAR (p) model may be determined using model selection criteria. The general approach is to fit VAR (p) models with orders p = 0,...,p *max* and choose the value of p which minimizes some model selection criteria. Model selection criteria for VAR (p) models have the general form

IC (p) = ln |Σ ˜(p)| + c T · ϕ(n,p)

where Σ ˜(p) = T −1 PT t=1 ˆ εtˆ ε0 t is the residual covariance matrix without a degrees of freedom correction from a VAR(p) model, cT is a sequence indexed by the sample size T, and ϕ(n,p) is a penalty function which penalizes large VAR(p) models

3.9.3 Cointegration Test

After establishing whether the series is stationary in levels or first-difference (and if the series are integrated of the same order), then Johansen's procedure is used to determine whether there exist a cointegrating vector among the variables (Johansen, 1988). The study establishes whether the non-stationary variables are cointegrated. Differencing of variables to achieve Stationarity leads to loss of long-run properties. The concept of cointegration implies that if there is a long-run relationship between two or more non-stationary variables, deviations from this long-run path are stationary. In testing for co integration the study used the Johansen co integration test (Maximum Eigenvalue statistic and Trace statistic). The Johansen cointegrating test is more accurate and superior to Engel granger test of cointegration because it gives the exact number of cointegrating equations in the model. The study hence used the Johansen cointegration test to perform the cointegration test.

Johansen cointegration uses two tests to determine the number of cointegrating vectors which are: the Maximum Eigen value test and the Trace test. The null hypothesis for the Maximum Eigen value is to test r cointegrating relations against the alternative of

r+1 cointegrating relations where r = 0, 1, 2, ..., n-1 and n is the number of variables in the system. The test statistic for Maximum Eigen value is computed as:

$LRmax\ (r/n + 1) = -T * \log\ (1 - \omega)\hat{}(5)$

Where ω is the Maximum Eigen value and T is the sample size.

The Trace statistics tests the null hypothesis of r cointegrating relations against the alternative of n cointegrating relations, where n is the number of variables in the system and r = 0, 1, 2, ..., n-1. The test statistic is computed using the following expression:

$LR_{tr}\ (r/) = -T * \Sigma^{n}{}_{i=r+1} \log\ (1 - \omega\hat{i})$

3.10 The Time Series Models Selection

Time series is a process observed in sequence over time, due to this sequential nature of time series, series in time y_t is not independent of series in timey_{t-1}. Time series can be separated into two main categories the univariate ($y_t \in R$is a scalar) and the multivariate ($y_t \in R^m$is a vector valued). The primary models for the univariate time series are the autoregressive models (ARs) while those of the multivariate time series are the vector autoregressive models (VARs) (Hansen, 2013).

3.10.1 Vector Autoregressive (VAR)

After performing the Johansen cointegration test, the study fit the appropriate time series model given the Johansen test results. Cointegration was established between the variables and VECM was applied to the series to determine the short run relationships.

The VAR model is one of the most successful, flexible, and easy to use models for the analysis of time series. The VAR model has proven to be especially useful for describing the dynamic behavior of economic and financial time series and for forecasting. It often provides superior forecasts to those from univariate time series

models and elaborate theory-based simultaneous equations models. Forecasts from VAR models are quite flexible because they can be made conditional on the potential future paths of specified variables in the model (Zivot & Wang, 2006).

The model is used in structural analysis where certain assumptions about the causal structure of the data under investigation are imposed, and the resulting causal impacts of unexpected shocks or innovations to specified variables on the variables in the model are summarized. These causal impacts are usually summarized with impulse response functions and forecast error variance decompositions (Zivot & Wang, 2006).

The general VAR (p) model has many parameters, and they may be difficult to interpret due to complex interactions and feedback between the variables in the model. As a result, the dynamic properties of a VAR (p) are often summarized using various types of structural analysis. The three main types of structural analysis summaries are (1) Granger causality tests; (2) impulse response functions; and (3) forecast error variance decompositions.

The basic p-lag vector autoregressive (VAR (p)) model has the following general form:

$$Y_t = c + \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \cdots + \Pi_p Y_{t-p} + \varepsilon t,\ t = 1, \ldots..T,$$

Where Π_i are $(n \times n)$ coefficient matrices and εt is an $(n \times 1)$ unobservable zero mean white noise vector process (serially uncorrelated or independent) with time invariant covariance matrix Σ.

A VAR model for this study took the following form:

$$GRATE_t = ß_0 + ß_1 EDT_{t-1} + ß_2 DDT_{t-1} + ß_3 DSR_{t-1} + ß_5 REER_{t-1} + \mu t$$

Where:

GRATE is the real GDP

EDT_{t-1} is the lag of stock of external debt

DDT_{t-1} is the lag of the stock of domestic

DSR_{t-1} is the lag of debt service

$REER_{t-1}$ is the lag of movements in real exchange rate

$ß_1$ ..... $ß_5$ are coefficients of lagged variables

µt model residual/ Error term

3.10.2 Vector Error correction (VECM) models

The short-run dynamics of the VAR model are captured with the Vector Error Correction Model which is similar to the short-run adjustment. The error correction term measures the speed of adjustment, or how much of disequilibria experienced in one period are corrected for in the subsequent period. Lütkepohl (2004) argues that if two *I* (1) series *x* and *y* are cointegrated, then there is exist unique α0 and α1 such that

$U_t \equiv yt- \alpha_0 - \alpha_1 x_t$ is *I*(0).

In the single-equation model of cointegration where *y i*s the dependent variable and *x* as an exogenous regressor, then a Vector error-correction model takes the following form:

$$\Delta y_t = ß y_0 + ß y_1 \Delta y_{t-1} + \ldots + ß y_p \Delta y_{t-p} + ¢ y_1 \Delta x_{t-1} + \ldots + ¢ y_p \Delta x_{t-p} - \lambda y(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v^y{}_t$$

$$\Delta X_t = ß x_0 + ß x_1 \Delta y_{t-1} + \ldots + ß x_p \Delta y_{t-p} + ¢ x_1 \Delta x_{t-1} + \ldots + ¢ x_p \Delta x_{t-p} - \lambda x(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v x_t$$

where

$y_t = \alpha_0 + \alpha_1 x_t$ is the long-run cointegrating relationship between two variables and

λy and λ*x* are the error-correction parameters that measure how *y* and *x* react to deviations from long-run equilibrium.

Once the Vector error correction system has been estimated, we can proceed to calculate impulse response function and variance decompositions, or to generate forecasts as we would with a VAR (Lütkepohl , 2004).

A VECM for this took the following form:

$\Delta GRATE_t = ß_0 + ß_{1\Delta} EDT_{t-1} + ß_{2\Delta} DDT_{t-1} + ß_{3\Delta} DSR_{t-1} + ß_{5\Delta} REER_{t-1} + \xi_{t-1}$

$+ \mu t$

Where:

GRATE is the real GDP

EDT_{t-1} is the lag of stock of external debt

DDT_{t-1} is the lag of the stock of domestic debt

DSR_{t-1} is the lag of debt service

$REER_{t-1}$ is the lag of movements in real exchange rate

Δ is the differencing operator

ξ_{t-1} is the lagged value of the error correction term / component used to capture the short –run effects/dynamics .It shows the speed of adjustment of the variables towards a long run equilibrium after short run fluctuations of the variables

$ß_1$ ..... $ß_5$ are coefficients of lagged and differenced variables

μt model residual/ Error term

3.11Post Estimation Diagnostic Tests

The study used a VECM model after testing for cointegrating systems and established presence of four cointegrating systems. After running the VECM, post estimation diagnostic tests were also conducted.

3.11.1 Causality Test

Causality analysis is normally carried out to review the presence of casual relationship between the variables in a study. The Granger causality test was employed to determine the presence or otherwise of these relationships between the dependent variable and the explanatory variables. Causality tests review the causal relationship between variables in the model and the direction to which the relationships is running from or to but (Brooks, 2008). One way direction gives a uni-directional causality and two way direction gives bi-directional causality.

3.11.2 Variance Decomposition Test

Granger causality does not explain the proportion of the movements in the dependent variable that are due to their own shocks and shocks of the predictor variables. A shock on a variable affects its own course and is also transmitted to all other variables in the model. The study used variance decomposition to determine how much of the period steps ahead, a forecast error variance of the dependent variable are explained by the dependent variable.

Variance decomposition determine how much of the S- steps ahead forecast error variance of a given variable is explained by innovations (error terms as it is called in time series) to each of the explanatory variables. S is 1, 2,…n. In variance decomposition an error term of one variable is introduced to a shock while holding all other error terms constant (Brooks, 2008).

3.11.3 VEC Residual Serial Correlation LM Tests

The study conducted autocorrelation tests after running VECM. Since the accepted lags were 4, the test was conducted at each lag. The null hypothesis is that there is no serial correlation at lag h.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Introduction

The section started by conducting an exploratory data analysis which involved the trend analysis, descriptive statistics of mean, standard deviation, minimum and maximum values recorded in the study period as well as the normality tests of Jarque Bera statistic, the unit root test for stationarity as was proposed by Dickey and Fuller (1976), the Johansen (1990) co integration test and vector error correction model. Post estimation tests were also conducted. They included the impulse response and variance decomposition tests, Granger causality test was carried out to determine whether there exist any causal relationships between the variables under study. Residual diagnostic tests involving tests of first order serial correlation, Heteroskedasticity and Normality of residuals were also conducted.

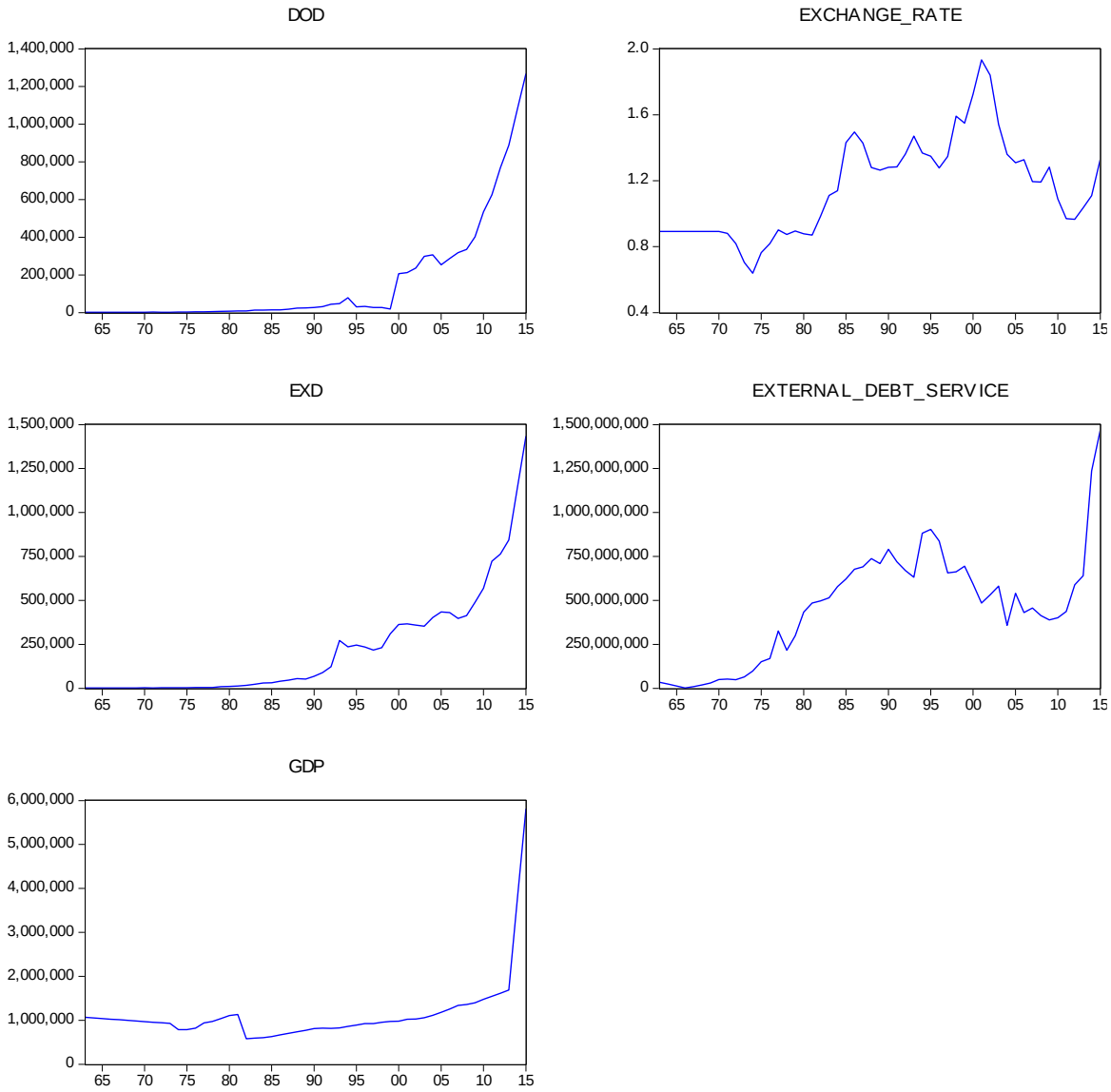
4.2 Exploratory of the Data

4.2.1 Trend Analysis

The study conducted the trend analysis in order to establish and graphically represent the change in the variables over time. This trend gives a picture of the stationarity of the variables.

The study findings indicate that the levels of domestic debt and external debt has been rising steadily with years. The two have been rising at a faster rate as compared to GDP growth which has indicated unsteady increasing and decreasing trends over the years. External debt service on the other hand has indicated unsteady trends over the study period.

Figure 4.1Trend analysis



4.2.2 Descriptive Statistics

Descriptive analysis was conducted to indicate the mean, standard deviation, Skewness, Kurtosis and normality of the variables using the Jarque Bera statistic which is a combination of both Skeweness and Kurtosis. Under the null hypothesis of a normal

distribution, the Jarque-Bera statistic is distributed with 2 degrees of freedom. The reported Probability is the probability that a Jarque-Bera statistic exceeds (in absolute value) the observed value under the null—a small probability value leads to the rejection of the null hypothesis of a normal distribution.

The descriptive findings indicated that the variation in external as well as domestic debt as indicated by their standard deviation was large. Exchange rate on the other hand also indicated large variations. Debt service also indicated large variations similar to GDP over the study period.

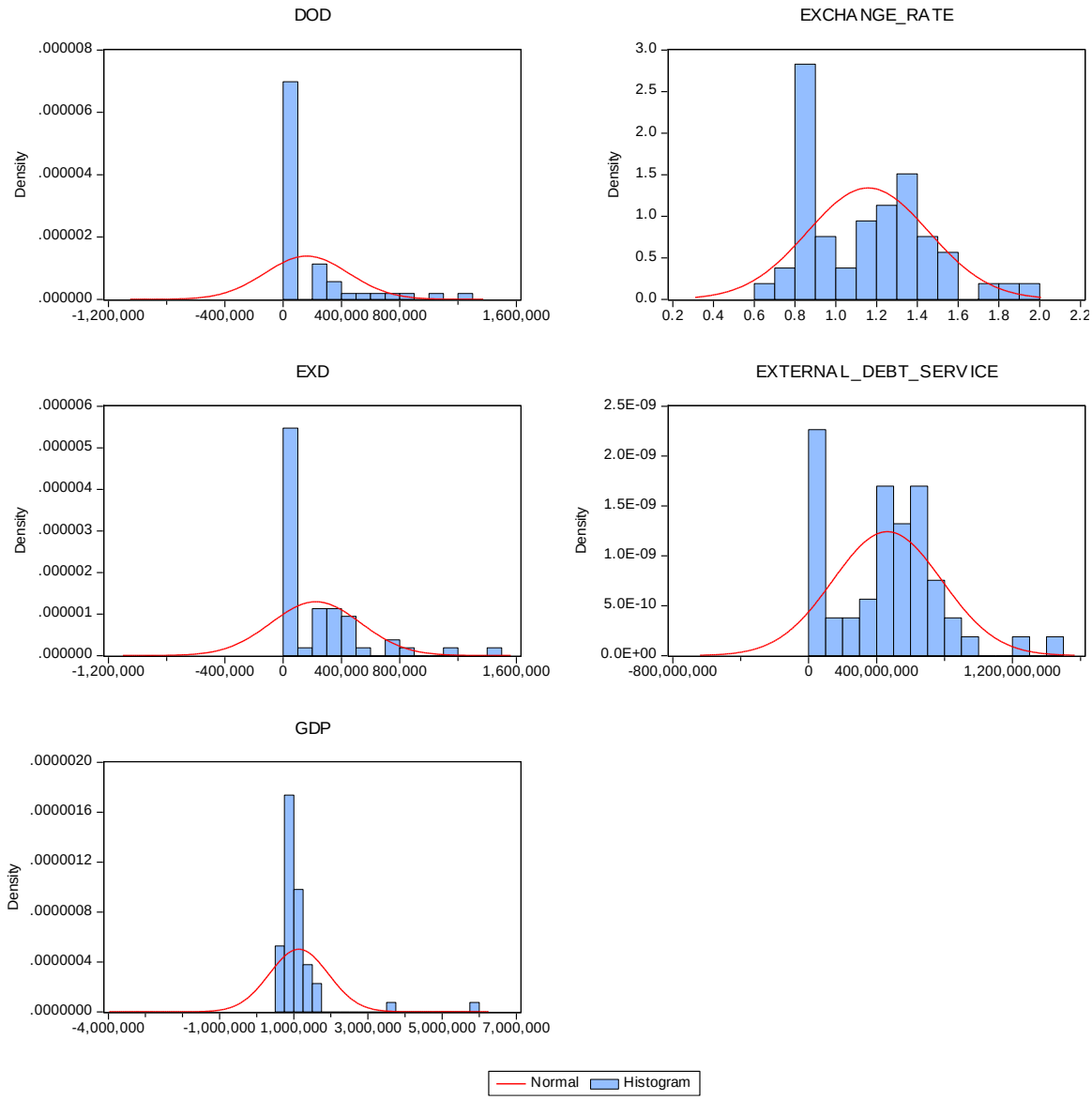
Table 4.1 Descriptive Statistics

	DOD	EXCHANGE RATE	EXD	DEBT SERVICE	GDP
Mean	161,789.663	1.159	224,070.426	463,342,561.006	1,137,049.824
Median	23,287.800	1.140	54,348.200	485,480,000.000	975,477.255
Maximum	1,268,433.800	1.933	1,433,447.200	1,470,271,333.333	5,808,849.780
Minimum	1,405.000	0.638	1,244.000	2,025,200.000	577,770.054
Std. Dev.	287,830.002	0.298	308,143.336	321,254,236.051	795,256.633
Skewness	2.277	0.485	1.921	0.494	4.591
Kurtosis	7.744	2.615	6.991	3.574	25.662
Jarque-Bera	95	2	68	3	1,320
Probability	0.000	0.301	0.000	0.237	0.000

The descriptive statistics discussed above indicated that the data for the variables were not normally distributed apart from the data for debt service and exchange rate hence there was need to transform domestic debt, external debt and GDP into their logs to

base ten in order to normalize it. The results for density distribution together with normality line shown in Figure 4.2 confirm the descriptive findings of normality.

Figure 4.2 Graphical Normality Tests



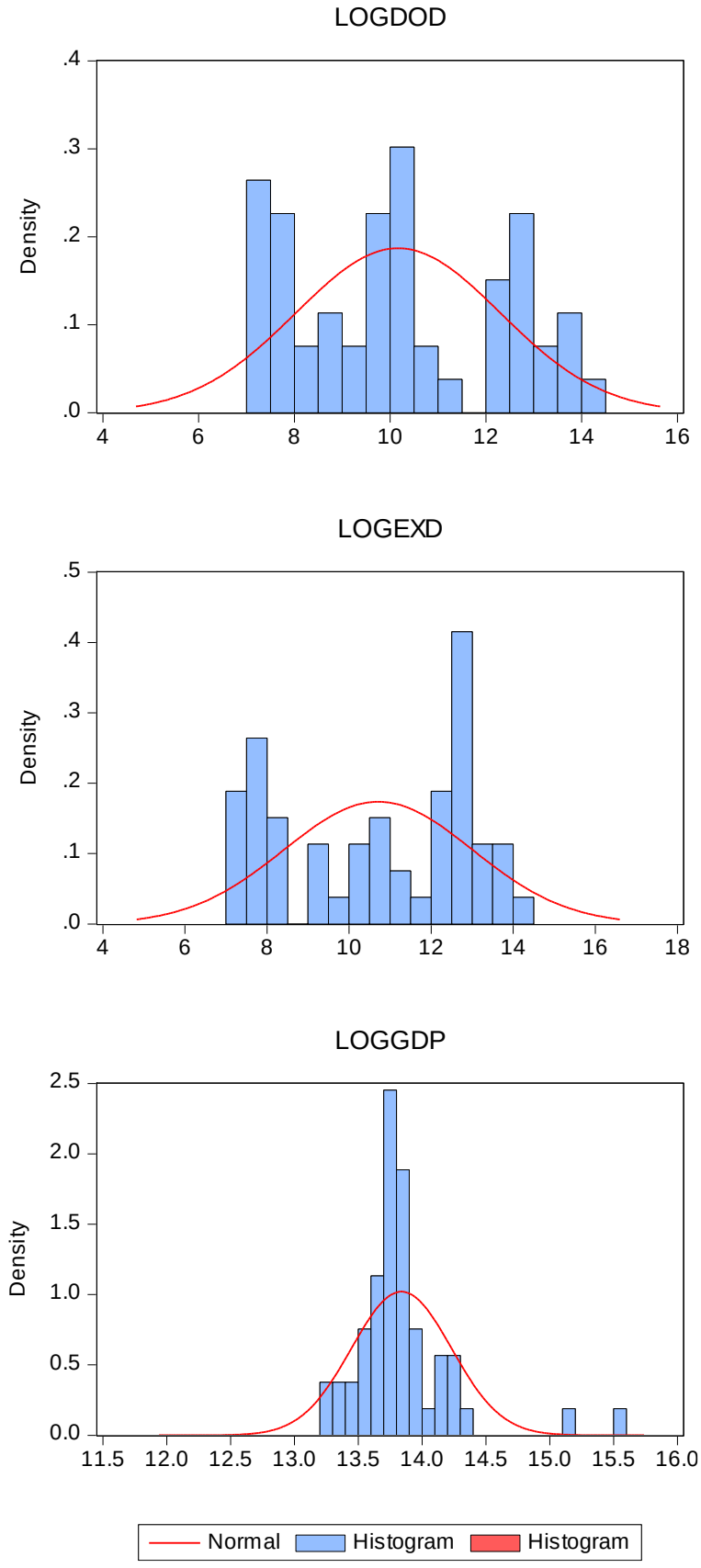
After transformation into logs, the normality tests were also conducted using both Jarque Bera and graphical representation.

Table 4.2 Normality Test after transformation

	LOGDOD	LOGEXD	LOGGDP
Jarque-Bera	3.872	5.219	169.707
Probability	0.144	0.074	0.052

The test for normality after transformation indicated that the null hypothesis of the data being normally distributed was not rejected at 5% level of significance indicating that log transformations normalized the data. The results are further presented graphically.

Figure 4.3 Graphical Normality Tests after transformation



4.2.3 Correlation Matrix

According to William *et al.* (2013), Multicollinearity refers to the presence of correlations between the predictor variables. In severe cases of perfect correlations between predictor variables, multicollinearity can imply that a unique least squares solution to a regression analysis cannot be computed (Field, 2009). Multicollinearity inflates the standard errors and confidence intervals leading to unstable estimates of the coefficients for individual predictors (Belsley *et al*., 1980). Multicollinearity was assessed in this study using a correlation matrix.

The Multicollinearity decision rule is that a high correlation coefficient between the regressors of absolute 0.8 and above implies the existence of Multicollinearity (Adam and Twenoboah, 2008). Williams (2008) argues that one of the ways of dealing with Multicollinearity may be that the best thing to do is simply to realize that Multicollinearity is present, and be aware of its consequences and ignore it. Since according to Williams (2008), it is sometimes suggested that you "drop" the offending variable but if the variable really belongs in the model, this can lead to specification error, which can be even worse than Multicollinearity. Hence even though there was a high Multicollinearity between domestic and external debt as recorded by a high Pearson correlation value of 0.9668, the study ignore as suggested by Williams (2008).

The results further indicated significant associations between GDP and external, domestic as well as debt service while the association between GDP and exchange rate was positive but not significant. The association between external debt as well as exchange rate and GDP were negative.

Table 4.3 Correlation Matrix

	GDP	EXD	DOD	EXCHANGE RATE
GDP	1			
EXD	-0.8278*	1		
DOD	0.8439*	0.9668*	1	
EXCHANGE RATE	-0.025	0.3095*	0.1367	1
DEBT SERVICE	0.4924*	0.6153*	0.5088*	0.6059*

4.3 Multiple Regression Model

The study conducted a multiple regression model and diagnostic analysis from the results so as to evaluate if the multiple regression model was sufficient for the data set. Previous studies for instance, Reinhart and Rogoff (2010 and 2012), Mustafa (2010), Shah and Pervin (2010) as well as Makau (2008) have used ordinary least square regression model to link public debt and economic growth.

Table 4.4 Multiple Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGEXD	(0.200)	0.083	(2.399)	0.020
LOGDOD	0.301	0.071	4.253	0.000
DEBT SERVICE	0.0001	0.000	2.322	0.024
EXCHANGE RATE	(0.489)	0.197	(2.479)	0.017
C	13.268	0.226	58.809	0.000
R-squared	0.560			
Adjusted R-squared	0.523			
F-statistic	15.245			
Prob (F-statistic)	0.000			

$$GDP = f(EDT_t, DDT_t, DSR_t, REER_t) + e_t$$

GDP = 13.268-0.2 EXD + 0.301 DOD + 0.0001 Debt service- 0.489 Exchange rate

Multiple regression analysis indicates that economic growth is negatively and significantly related to external debt as well as exchange rate but positively and significantly related to domestic debt as well as debt service.

4.4. Post Multiple Regression Model Estimation Tests

Ordinary least squares (OLS) assumption stipulates that the residuals should have a constant variance (i.e. they should be Homoskedastic).

4.4.1 Heteroscedasticity Test

Heteroscedasticity occurs when the variances of the error terms are not constant, this has the consequence of arriving at estimators that are unbiased and consistent but they are inefficient. The variances of the estimated estimators are not the minimum variances. This test was carried out to ascertain whether using a multiple regression model in OLS is sufficient to the study. Heteroscedasticity test was carried out using Breusch-Pagan-Godfrey test and the results were reported in table 4.5.

The null hypothesis of homoscedasticity is rejected if the calculated statistics value exceeds critical table value. The results indicate that the observed probability chi square significance of 0.0003 was significant hence the null hypothesis of existence of homoscedasticity is rejected and hence there existed Heteroskedasticity. This meant that based on this test alone the fitted multiple regression model was not a good fit.

Table 4.5 Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	7.7598	Prob. F(4,48)	0.0001
Obs*R-squared	20.8134	Prob. Chi-Square(4)	0.0003

Scaled explained SS	29.0360	Prob. Chi-Square(4)	0.0000

4.4.2 Autocorrelation Test

Table 4.6 Breusch-Godfrey Serial Correlation LM Test

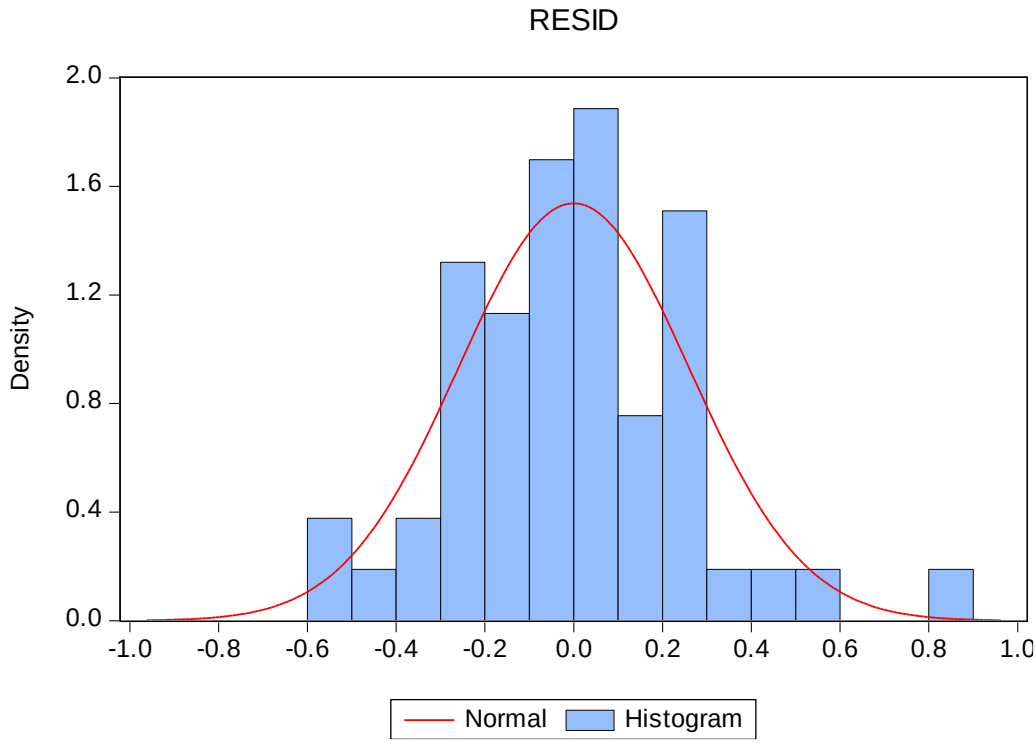
Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	28.146	Prob. F(2,46)		0.000
Obs*R-squared	29.166	Prob. Chi-Square(2)		0.000

The test for autocorrelation was performed to establish whether residuals are correlated across time. OLS assumptions require that residuals should not be correlated across time and thus the Breusch–Godfrey test which is also an LM test was adopted in this study. The null hypothesis is that no first order serial /auto correlation exists. Based on the findings, the observed probability chi square was significant at 5% level of significance hence the null hypothesis was rejected implying that there was presence of first order serial correlation.

4.4.3 Residual Normality Test

The test for normality was first examined using the graphical method approach as shown in the Figure 4.4 below. The results in the figure indicate that the residuals are normally distributed.

Figure 4.4 Graphical Residual Normality Representation



To further establish whether the residuals are normally distributed the study adopted the Jarque-Bera test which is a more conclusive test than the graphical inspection approach of testing for normality. The results in Table 4.7 indicate the results of the Jarque-Bera test. The null hypothesis under this test is that the residuals are significantly different from a normal distribution. Given that the p-value is less than 5% for the residual, the null hypothesis is rejected and thus the conclusion that the residuals are not normally distributed.

Table 4.7 Residual Normality Test (Jarque Bera Test)

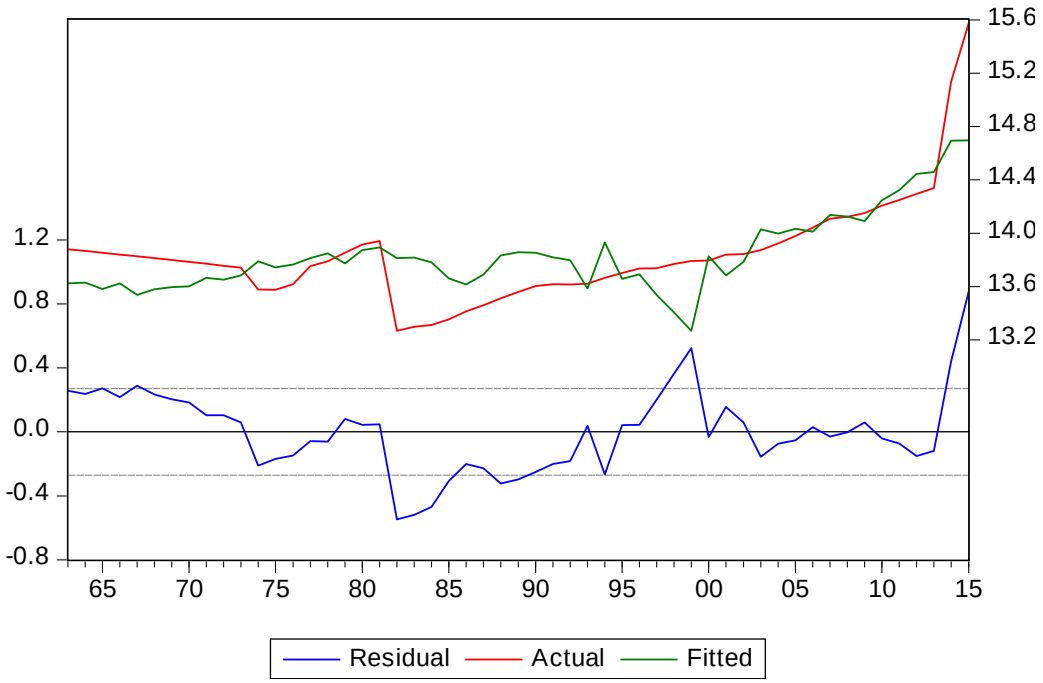
RESID	
Jarque-Bera	6.9918
Probability	0.0303

4.4.4 Residual plot

Residual analysis is a post regression estimation test that evaluates the goodness of the fit of the fitted regression model (Greene, 2002). If the graph of fitted versus residuals form a pattern is an indication that the regression model might not be a good fit. Results in Figure 4.6 indicate that the residuals seem to form patterns and that indicate that the regression model may not be a good fit.

Regression model was thus found to be insufficient for analyzing the data in this study because of presence of serial correlation, Heteroskedasticity, residuals were not normally distributed and that the residual analysis had patterns formed by the residual plots. The study thus proceeded to analyze the data using other models that are available for time series data set.

Figure 4.5 Residual Plot



4.5 Time Series Models

4.5.1 Unit Root Test

Most economic variables are usually non-stationary in nature and prior to running a regression analysis. Unit root tests were thus conducted using the ADF test to establish whether the variables were stationary or non-stationary. The purpose of this is to avoid spurious regression results being obtained by using non-stationary series.

Augmented Dickey Fuller (ADF) test was employed to determine existence stationarity or otherwise. ADF was chosen because it takes care of autocorrelation in case it is present in the series (Brooks, 2008).

HO: $\alpha = 0$ (the series has a unit root).

H1: $\alpha \neq 0$ (the series has no unit root).

The decision criterion is through comparison of the absolute tau statistic value (tau calculated) and Dickey - Fuller critical table value and if the absolute tau statistic value is greater than the absolute Dickey - Fuller critical table value the null hypothesis that the series has a unit root is not rejected.

The results indicated that all the variables were non stationary at level apart from exchange rate hence first differencing was conducted on the non stationary variables.

Table 4.8 Unit Root (None and Level)

Variable name	ADF Statistic	1% Level	5% Level	10% Level	Comment
DOD	5.485	-2.615	-1.948	-1.612	Non Stationary
Exchange rate	-0.002	-2.611	-1.947	-1.613	Stationary

Variable name	ADF Statistic	1% Level	5% Level	10% Level	Comment
EXD	3.834	-2.611	-1.947	-1.613	Non Stationary
Debt service	1.534	-2.610	-1.947	-1.613	Non Stationary
GDP	1.643	-2.611	-1.947	-1.613	Non Stationary

Table 4.8 Unit Root (None and First difference)

Variable name	ADF Statistic	1% Level	5% Level	10% Level	Stationary
DOD	-8.679	-2.613	-1.948	-1.613	Stationary
EXD	-12.990	-2.612	-1.948	-1.613	Stationary
Debt service	-13.826	-2.612	-1.948	-1.613	Stationary
GDP	-11.169	-2.612	-1.948	-1.613	Non Stationary

The results indicated that all the variables became stationary at none after first differencing.

4.5.2. Optimal Lag Length

Before the Cointegration test is performed, the optimal lag length for analysis should be identified (Simiyu, 2015). The lag length can be selected using the information selection criteria which include: Sequential Modified Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC) and Hannan-Quinn Information Criterion (HQIC) and ensuring that the residuals are white noise as suggested by Ivanov et al (2005). According to Simiyu (2015), there is no clear rule of thumb on which criterion to use for optimal lag length selection among the above methods. However, the decision rule is to choose the model with lowest value of information criteria.

In choosing the optimal lag length, this study used the information criterion such as Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC) and the Scharz Bayesian Information Criterion (SBIC). These criterion were preferred because they are more effective than graphical procedures which determine the number of lags by examining autocorrelation function (ACFs) and the partial autocorrelation function (PACFs) patterns.

Although no criterion is superior to the others the study chose Akaike Information Criterion because of its efficiency property, thus the study chose four lag length to be used in this model as the optimal lag length. The optimal lag length decision is supported by likelihood ratio test and the final prediction error criterion results.

Table 4.9 Lag Order Selection Criteria

VAR Lag Order Selection Criteria

Endogenous variables: LOGGDP LOGEXD LOGDOD DEBT SERVICE EXCHANGE RATE

Exogenous variables: C

Date: 09/28/16 Time: 11:30

Sample: 1963 2015

Included observations: 49

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1150.252054092184	NA	2.07e+14	47.15315	47.34619	47.22639
1	-900.3226042542521	438.6517	2.15e+10	37.97235	39.13061*	38.41179*
2	-871.8154342880006	44.21520	1.92e+10*	37.82920	39.95267	38.63484
3	-855.0971484186357	22.51851	2.93e+10	38.16723	41.25592	39.33907
4	-819.0170921889746	41.23435*	2.22e+10	37.71498*	41.76888	39.25303

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

4.5.3 Co integration

Cointegration reviews long run relationship between variables in a study and the conditions for cointegration are that the series must be non-stationary and integrated of order one, the unit root tests results from this study fulfill these conditions and thus cointegration analysis was performed to establish existence or non-existence of long term relationship between the variables in the study.

The null hypothesis was that there is no cointegration against an alternative hypothesis that there is cointegration. The null hypothesis is rejected if the absolute

statistics test value is greater than the absolute critical value for cointegration (Brooks, 2008).

HO: $\alpha = 0$ (The series does not have cointegration relationships).

H1: $\alpha \neq 0$ (The series has cointegration relationships).

The Johansen co integration test was conducted since its more accurate and superior to Engel granger test of cointegration.

Johansen results indicate that the null hypothesis of at most 2 co integration equations for the model linking inflation to its determinants was rejected at 5% significance level. The trace statistic for the null hypothesis for the existence of at most 2 cointergration equations was larger than the set critical value at 5%. This implies that more than 2, that is 3 Cointegrating equations exists this further implies that all the variables in the inflation model converge to an equilibrium in the longrun (i.e are co intergrated) as shown in Table 4.10.

Table 4.10 Johansen Cointegration

Series: LOGGDP LOGEXD LOGDOD DEBT SERVICE EXCHANGE RATE
Lags interval (in first differences): 1 to 4
Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.645	122.162	76.973	0.000
At most 1 *	0.489	72.509	54.079	0.001
At most 2 *	0.422	40.276	35.193	0.013
At most 3	0.167	14.003	20.262	0.289
At most 4	0.103	5.224	9.165	0.260

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4.11 The Cointegrating Equation

Cointegrating Equation(s):		Log likelihood	-816.6443239		
Normalized cointegrating coefficients (standard error in parentheses)					
LOGGDP	LOGEXD	LOGDOD	DEBT SERVICE	EXCHANGE RATE	C
1	-9.627	8.350	0.001	-9.050	6.509
	1.590	1.411	0.000	3.564	4.012

Cointegration establishes long run relationships between the variables in the study from equation in Table 4.11 above it was reviewed that external debt had a long run negative relationship with GDP, domestic debt had a long run positive relationship with GDP, external debt had a positive long run relationship with GDP and exchange rate had a negative long run relationship with GDP. Only external debt service had a significant relationship with GDP.

4.6 The Time Series Fitted Model

Time series is a process observed in sequence over time, due to this sequential nature of time series, series in time y_t is not independent of series in timey_{t-1}. A univariate time series analysis involves only one explanatory variable while multivariable involves two or more explanatory variables, this study has four independent variables and therefore it uses multivariate models in its analysis.

4.6.1 Vector Error Correction Model

The short-run dynamics of the VAR model are captured with the Vector Error Correction Model which is similar to the short-run adjustment. The error correction term measures the speed of adjustment, or how much of disequilibria experienced in one period are corrected for in the subsequent period.

VECM requires the variables to be cointegrated. VECM determines short term dynamics of variables by restricting for the long term relationships of variables through

cointegrating relations while allowing for the short run adjustments back to the long run equilibrium whenever deviations occur (Brooks, 2008).

A VECM for this study took the following form:

$\Delta GDP_t = ß_0 + ß_{1\Delta} EDT_{t-1} + ß_{2\Delta} DDT_{t-1} + ß_{3\Delta} DSR_{t-1} + ß_{5\Delta} REER_{t-1} + \xi_{t-1}$

$+ \mu t$

Where:

GDP is the Gross Domestic Product

EDT_{t-1} is the lag of stock of external debt

DDT_{t-1} is the lag of the stock of domestic debt

DSR_{t-1} is the lag of debt service

$REER_{t-1}$ is the lag of movements in real exchange rate

Δ is the differencing operator

ξ_{t-1} is the lagged value of the error correction term / component used to capture the short –run effects/dynamics . It shows the speed of adjustment of the variables towards a long run equilibrium after short run fluctuations of the variables

$ß_1$ ..... $ß_5$ are coefficients of lagged and differenced variables

μt model residual/ Error term

Table 4.12 The Vector Error Correction Model

Included observations: 48 after adjustments					
Standard errors in ( ) & t-statistics in [ ]					
Cointegrating Eq:	CointEq1	CointEq2	CointEq3		
LOGGDP(-1)	1	0	0		
LOGEXD(-1)	0	1	0		
LOGDOD(-1)	0	0	1		
DEBT SERVICE(-1)	(0.000)	(0.000)	(0.000)		
	0.000	0.000	0.000		
	[-1.92998]	[-2.05718]	[-2.02681]		
EXCHANGE_RATE(-1)	11.473	73.080	81.744		
	15.716	95.680	108.298		
	[0.73003]	[0.76380]	[0.75480]		
C	(14.026)	(10.774)	(10.436)		
Error Correction:	D(LOGGDP)	D(LOGEXD)	D(LOGDOD)	D(DEBT SERVICE)	D(EXCHANGE_RATE)
CointEq1	-0.3347	0.3951	0.2691	58452776.2651	0.3565
	0.2780	0.2522	0.5139	201966143.2430	0.1131
	[-1.20390]	[1.56636]	[0.52367]	[0.28942]	[3.15289]
CointEq2	0.1022	-0.5770	0.4119	-74463029.7357	0.0516
	0.1439	0.1306	0.2660	104548114.0959	0.0585
	[0.70998]	[-4.41929]	[1.54826]	[-0.71224]	[0.88154]
CointEq3	-0.0433	0.4507	-0.4046	57493123.1734	-0.0978
	0.1243	0.1128	0.2299	90332875.0292	0.0506
	[-0.34853]	[3.99506]	[-1.76038]	[0.63646]	[-1.93460]
D(LOGGDP(-	0.2962	-0.5800	-1.1492	102852130.0701	-0.4582

1))					
	0.3285	0.2981	0.6073	238662115.3008	0.1336
	[0.90171]	[-1.94577]	[-1.89229]	[0.43095]	[-3.42943]
D(LOGGDP(-2))	0.2502	-0.1976	0.0615	-2731674.7442	-0.1194
	0.3211	0.2913	0.5935	233252065.7800	0.1306
	[0.77943]	[-0.67848]	[0.10355]	[-0.01171]	[-0.91429]
D(LOGGDP(-3))	0.0361	0.1637	0.1558	-5836608.9725	-0.6190
	0.2955	0.2681	0.5463	214710381.0665	0.1202
	[0.12222]	[0.61040]	[0.28526]	[-0.02718]	[-5.14954]
D(LOGGDP(-4))	0.1442	0.0036	-0.7574	-21920358.2032	-0.3963
	0.4262	0.3867	0.7879	309648180.0350	0.1733
	[0.33836]	[0.00929]	[-0.96132]	[-0.07079]	[-2.28643]
D(LOGEXD(-1))	-0.0490	-0.0453	0.7469	184375911.3931	0.0132
	0.1592	0.1444	0.2943	115649293.4738	0.0647
	[-0.30795]	[-0.31390]	[2.53802]	[1.59427]	[0.20378]
D(LOGEXD(-2))	-0.1091	-0.0489	-0.4320	56815474.2498	-0.0711
	0.1939	0.1759	0.3585	140869867.3899	0.0789
	[-0.56277]	[-0.27801]	[-1.20531]	[0.40332]	[-0.90155]
D(LOGEXD(-3))	-0.4350	-0.1589	-1.2866	-10103657.5811	-0.0791
	0.2147	0.1948	0.3969	155980226.3778	0.0873
	[-2.02614]	[-0.81567]	[-3.24160]	[-0.06478]	[-0.90618]
D(LOGEXD(-4))	-0.1872	-0.2643	-0.9809	27194511.3966	-0.1545
	0.2666	0.2419	0.4928	193679025.2732	0.1084
	[-0.70214]	[-1.09263]	[-1.99029]	[0.14041]	[-1.42529]
D(LOGDOD(-1))	0.0514	-0.3110	-0.0475	-15295738.6134	0.1700
	0.1420	0.1288	0.2624	103133033.4326	0.0577
	[0.36179]	[-2.41480]	[-0.18108]	[-0.14831]	[2.94440]
D(LOGDOD(-2))	0.1192	-0.1519	0.3594	87810024.8759	0.0573

	0.1181	0.1072	0.2183	85804571.5859	0.0480
	[1.00904]	[-1.41721]	[1.64606]	[1.02337]	[1.19294]
D(LOGDOD(-3))	0.0958	-0.0381	0.1917	43717701.8297	-0.0337
	0.1138	0.1032	0.2103	82656933.3113	0.0463
	[0.84242]	[-0.36914]	[0.91153]	[0.52891]	[-0.72850]
D(LOGDOD(-4))	0.0360	0.0000	0.0187	-63867230.4026	-0.0018
	0.0963	0.0874	0.1780	69955676.2978	0.0392
	[0.37412]	[-0.00025]	[0.10496]	[-0.91297]	[-0.04599]
D(DEBT SERVICE(-1))	0.0000	0.0000	0.0000	-0.3429	0.0000
	0.0000	0.0000	0.0000	0.5508	0.0000
	[1.22789]	[-3.75398]	[0.96321]	[-0.62244]	[-0.48999]
D(DEBT SERVICE(-2))	0.0000	0.0000	0.0000	0.1789	0.0000
	0.0000	0.0000	0.0000	0.5788	0.0000
	[1.55844]	[-2.75985]	[1.99339]	[0.30914]	[0.22314]
D(DEBT SERVICE(-3))	0.0000	0.0000	0.0000	-0.0913	0.0000
	0.0000	0.0000	0.0000	0.5537	0.0000
	[0.97419]	[-2.43727]	[0.35536]	[-0.16491]	[0.90467]
D(DEBT SERVICE(-4))	0.0000	0.0000	0.0000	0.0591	0.0000
	0.0000	0.0000	0.0000	0.3740	0.0000
	[0.88009]	[-2.52986]	[-0.22076]	[0.15815]	[1.16825]
D(EXCHANGE_RATE(-1))	0.2796	0.8814	-0.6680	47376193.2611	-0.0711
	0.4882	0.4430	0.9026	354706154.2605	0.1986
	[0.57279]	[1.98963]	[-0.74007]	[0.13356]	[-0.35816]
D(EXCHANGE_RATE(-2))	-0.1129	0.8563	1.0563	-38169996.9441	-0.0827
	0.3525	0.3198	0.6516	256064736.7565	0.1433
	[-0.32029]	[2.67763]	[1.62121]	[-0.14906]	[-0.57692]
D(EXCHANGE_RATE(-3))	-0.1089	0.4692	-0.0063	-117425038.2253	-0.1545
	0.3726	0.3380	0.6888	270679411.2125	0.1515

	[-0.29219]	[1.38792]	[-0.00912]	[-0.43382]	[-1.01955]
D(EXCHANGE_RATE(-4))	-0.2801	0.3982	-0.2344	-195537724.2043	-0.0488
	0.3215	0.2917	0.5944	233603503.5961	0.1308
	[-0.87116]	[1.36504]	[-0.39436]	[-0.83705]	[-0.37287]
C	0.0359	0.4039	0.2843	-7433396.6135	0.0426
	0.0815	0.0739	0.1506	59199810.5318	0.0331
	[0.44061]	[5.46315]	[1.88739]	[-0.12556]	[1.28426]
R-squared	0.3801	0.5947	0.6217	0.3950	0.7865
Adj. R-squared	-0.2140	0.2064	0.2591	-0.1849	0.5819
Sum sq. resids	0.8209	0.6758	2.8057	4333221165835 37000.0000	0.1358
S.E. equation	0.1849	0.1678	0.3419	134369223.3772	0.0752
F-statistic	0.6397	1.5314	1.7146	0.6812	3.8437
Log likelihood	29.5348	34.2030	0.0401	-949.8464	72.7182
Akaike AIC	-0.2306	-0.4251	0.9983	40.5769	-2.0299
Schwarz SC	0.7050	0.5105	1.9339	41.5125	-1.0943
Mean dependent	0.0364	0.1372	0.1394	30448029.8611	0.0091
S.D. dependent	0.1679	0.1884	0.3972	123442694.9703	0.1163
Determinant resid covariance (dof adj.)		3537295285.2383			
Determinant resid covariance		110540477.6637			
Log likelihood		-785.0467			
Akaike information criterion		38.3353			
Schwarz criterion		43.5980			

The first part of the output of the results indicates the coefficient estimates that represent the long run relationships between the variables similar to the cointegrating equations.

The short run dynamics of the equation are presented in the second part of the output. The coefficient estimate corresponding to the cointegrating equation (CointEq1)

and the differenced dependent variable (D(GDP)) represent the model's adjustment speed back to the long run equilibrium, while those corresponding to the first raw and columns two, three and four represent adjustment speed back to long run equilibriums of each individual differenced regressors. According to Brooks, (2008) VECM allows for individual regressors to adjust back to their own long run equilibriums relations and also for collective adjustment of all explanatory variables working together to restore the model's long run equilibrium relationships.

VECM yields an equal number of error correction term equations as the number of variables in the model. The first one relate to the whole model adjustment speed to its long run equilibrium in an event of deviations, the others relate to individual independent variables' adjustment speed to their own long run equilibrium relationships if they had deviated from them. This study developed four VECM equations from the data out and used them to analyze the short run relationships of the regressors and the dependent variable. The equations are based on one cointegrating equation with four lags as it had been identified earlier. The VEC model equations follow a general format as given in the equation below.

$$\Delta Y_t = \beta_0 + \beta_1 ECT_{t-1} + \beta_2 \Delta X_{2\,t-1} + \beta_3 \Delta X_{3\,t-1} + \beta_4 \Delta X_{4\,t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots$$

Where: Δ = to the difference operator.

β_0 = the equation intercept.

$X_{2,3\,\&\,4\,t-1}$ = lagged values of the independent variables.

ECT = the error correction term.

β_1 = coefficient for adjustment speed back to the long run equilibrium.

From the results, the adjustment speed rate for the model at which it adjusts back to its long run equilibrium was found to be 33.47% if there are deviations from the long run equilibrium. The statistics coefficient of 0.3347 indicate that the short run deviations have risen above the model long run equilibrium and the model is expected adjust downwards at a speed of 33.47% to restore the long run equilibrium position.

The independent variables individual adjustment speed rates back to their own long run equilibriums were found to be 39.51%, 26.91%, 5845277626.51% and 35.65% for external debt, domestic debt, debt service and exchange rate respectively. All the three explanatory variables were found to have dropped below their own individual long run equilibriums, and the VECM results show that they are expected to increase at their respective adjustment speed rate to restore their own individual long run equilibrium.

Debt service was found to have very high adjustment speed rate such that its deviations from the long run equilibrium position are adjusted swiftly and rapidly such that they may pass unnoticed. Further findings indicated that Debt service does not have a significant relationship with economic growth as indicated by a t-statistic less than 2 when related to all the four lags of GDP.

Debt service was found to have very high adjustment speed rate such that its deviations from the long run equilibrium position are adjusted swiftly and rapidly such that they may pass unnoticed. Further findings indicated that debt service does not have a significant relationship with economic growth as indicated by a t-statistic less than 2 when related to all the four lags of GDP(t= 0.43095, -0.01171, -0.02718 and -0.07079 at lag 1, 2, 3 and 4 of the GDP respectively. The adjustment speed was very high to be felt in the short run.

External debt was found to no significant relationship with economic growth as indicated by a t-statistic less than 2 when related to all the four lags of GDP(t=-1.94577, -0.67848, 0.61040 and 0.00929) at lag 1, 2, 3 and 4 of the GDP respectively. The adjustment speed of external debt back to equilibrium was very fast to be felt in the short run.

Domestic debt was also found to have no significant relationship with GDP in the short run as indicated by a t-statistic of (-1.89229, 0.10355, 0.28526 and -0.96132) at lag 1, 2, 3 and 4 of GDP respectively. The speed of adjustment of domestic debt to equilibrium was faster to be noticed in the short run.

Only exchange rate had a significant short run relationship with GDP as indicated by t-statistics of -3.42943, -0.91429, -5.14954 and -2.28643 at the 1, 2, 3 and 4 lag of GDP growth respectively. The speed of adjustment back to its equilibrium is slow to be noticed in the short run.

The analysis of the cointegration and VECM indicates the long run and short run relationship respectively. VECM further indicates the speed of adjustment to equilibrium of the variables. The two however don't indicate the causal relationship between the variables hence the study established the granger causality of the variables on each other to establish the causal relationships.

4.7. Post Estimation Diagnostics Tests

4.8.1. Causality Test

Causality analysis is normally carried out to review the presence of casual relationship between the variables in a study. The Granger causality test was employed to determine the presence or otherwise of these relationships between the dependent variable and the explanatory variables. Causality tests review the causal relationship between

variables in the model and the direction to which the relationships is running from or to but (Brooks, 2008).

The null hypothesis is rejected if the F-statistic is significant. The findings in Table 4.13 indicate that there exists a uni-directional relationship between external debt and domestic debt as the null hypothesis of external debt not causing domestic debt is rejected. This implies that external debt causes domestic debt but domestic debt does not cause external debt.

Further results indicated a uni-directional relationship between debt service and exchange rate. The null hypothesis that debt service does not granger cause exchange rate is rejected hence debt service granger causes exchange rate. However, exchange rate does not granger cause debt service.

Table 4.13 Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.
LOGEXD does not Granger Cause LOGGDP	1.291	0.285
LOGGDP does not Granger Cause LOGEXD	0.012	0.988
LOGDOD does not Granger Cause LOGGDP	1.796	0.177
LOGGDP does not Granger Cause LOGDOD	0.173	0.842
DEBT SERVICE does not Granger Cause LOGGDP	1.323	0.276
LOGGDP does not Granger Cause DEBT SERVICE	1.926	0.157
EXCHANGE_RATE does not Granger Cause LOGGDP	1.186	0.315
LOGGDP does not Granger Cause EXCHANGE_RATE	0.230	0.795
LOGDOD does not Granger Cause LOGEXD	0.204	0.816
LOGEXD does not Granger Cause LOGDOD	4.464	0.017
DEBT SERVICE does not Granger Cause LOGEXD	1.247	0.297
LOGEXD does not Granger Cause DEBT SERVICE	2.834	0.069
EXCHANGE_RATE does not Granger Cause LOGEXD	1.462	0.242
LOGEXD does not Granger Cause EXCHANGE_RATE	1.999	0.147

DEBT SERVICE does not Granger Cause LOGDOD	0.105	0.900
LOGDOD does not Granger Cause DEBT SERVICE	1.680	0.198
EXCHANGE_RATE does not Granger Cause LOGDOD	0.411	0.666
LOGDOD does not Granger Cause EXCHANGE_RATE	1.295	0.284
EXCHANGE_RATE does not Granger Cause DEBT SERVICE	2.542	0.090
DEBT SERVICE does not Granger Cause EXCHANGE_RATE	7.738	0.001

4.8.2. Variance decomposition

Granger causality does not explain the proportion of the movements in the GDP growth that are due to their own shocks and shocks of the other variables. A shock on a variable affects its own course and is also transmitted to all other variables in the model. The study used variance decomposition to determine how much of the period steps ahead, a forecast error variance of GDP are explained by innovations of exchange rate, debt service, domestic and external debt in five percentiles of the study period.

The study findings indicated that in the first percentile, that is the first decade from independence, changes in GDP were largely due to its own variations which stood at 100% and the predictor variables (external debt, domestic debt, debt service and exchange rate) didn't contribute to the changes in GDP.

The findings further indicate that in the second decade, the changes in GDP were still largely attributed to itself while external debt, domestic debt, debt service and exchange rate contributed less than 2% to GDP.

The findings reveal that as the years progressed, the contribution of the predictor variables to GDP increased to more than 5% . In the final decade which is between the year 2005 and the year 2015, the results reveal that the changes in GDP were largely

contributed itself and other factors other than the external debt, domestic debt, exchange rate and debt service as indicated by 79.2%.

Table 4.14 Variance decomposition

Variance Decomposition of LOGGDP:						
Period	S.E.	LOG GDP	LOG EXD	LOG DOD	DEBT SERVICE	EXCHANGE RATE
1	0.186	100.000	0.000	0.000	0.000	0.000
2	0.305	97.290	0.845	0.119	1.316	0.430
3	0.465	90.307	1.844	0.555	6.702	0.593
4	0.638	84.901	1.388	0.875	12.303	0.533
5	0.861	79.190	1.117	1.016	18.372	0.305

4.8.3 VEC Residual Serial Correlation LM Tests

The study conducted the VEC residual serial correlation test to establish the of first order serial autocorrelation in the residuals of the model. Since the accepted lags were 4, the test was conducted at each lag. The null hypothesis is that there is no serial correlation at lag h.

The results in Table 4.15 indicate that there was no serial autocorrelation at each of the four lags since the p-value was not significant at 5% level of significance. The model was hence good in predicting the short run relationships between the variables.

Table 4.15 VEC Residual Serial Correlation LM Tests

VEC Residual Serial Correlation LM Tests	

Null Hypothesis: no serial correlation at lag order h		
Sample: 1963 2015		
Included observations: 48		
Lags	LM-Stat	Prob
1	23.679	0.538
2	24.516	0.490
3	25.332	0.444
4	36.590	0.063
Probs from chi-square with 25 df.		

4.9. Control effect of exchange rate on GDP

The study ran two regression models to test for the control effect of exchange rate on GDP. One regression model was without exchange rate.

$$\text{GDP} = \beta_0 + \beta_1 \text{EXD} + \beta_2 \text{DOD} + 3\text{Debt Service} + \mu_t$$

Table 4.16 Control effect of exchange rate (Model One)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGEXD	-0.313	0.073	-4.269	0.000
LOGDOD	0.377	0.067	5.602	0.000
DEBT SERVICE	0.000	0.000	2.278	0.027
C	13.138	0.231	56.962	0.000
R-squared	0.503			
Adjusted R-squared	0.473			

The results indicate that, external debt, domestic debt and debt service explain 50.3% of the changes in GDP without exchange rate being put in consideration. The study then ran a second regression model with inclusion of exchange rate as indicated in Table 4.17.

Table 4.17 Control effect of exchange rate (Model Two)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGEXD	-0.200	0.083	-2.399	0.020
LOGDOD	0.301	0.071	4.253	0.000
EXTERNAL_DEBT_SERVICE	0.000	0.000	2.322	0.024

EXCHANGE_RATE	-0.489	0.197	-2.479	0.017
C	13.268	0.226	58.809	0.000
R-squared	0.560			
Adjusted R-squared	0.523			

The results indicate that, external debt, domestic debt, exchange rate and debt service explain 56% of the changes in GDP with exchange rate being put in consideration. The change in R-square indicates that exchange rate as control variable affects GDP negatively and significantly (P value = 0.000).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings and discussions, conclusions and recommendations based on the findings and interpretation of the results from the data analyzed. The study established the effects of public debts on economic growth in Kenya. Data spanning 53 years was used. The findings were discussed in line with the specific objectives of this study. The discussions encompass comparing and contrasting the results of this study with empirical findings from the existing literature.

5.2 Summary of Findings

The study findings indicated that the levels of domestic debt and external debt have been rising steadily with years. The two have been rising at a faster rate as compared to GDP growth which has indicated unsteady increasing and decreasing trends over the years. Debt service on the other hand has indicated unsteady trends over the study period.

The results further indicated significant associations between GDP and external, domestic as well as debt service while the association between GDP and exchange rate was positive but not significant. The association between external debt as well as exchange rate and GDP were negative.

Multiple regression analysis indicates that economic growth is negatively and significantly related to external debt as well as exchange rate but positively and significantly related to domestic debt as well as debt service.

Furthermore, in the long run, the external debt had a long run negative relationship with GDP, domestic debt had a long run positive relationship with GDP, external debt had a positive long run relationship with GDP and exchange rate had a

negative long run relationship with GDP. Only debt service had a significant relationship with GDP.

Further findings indicated that the adjustment speed rate of GDP back to its long run equilibrium was found to be 33.47% if there are deviations from the long run equilibrium. The statistics coefficient of 0.3347 indicated that the short run deviations had risen above the model long run equilibrium and the model was expected to adjust downwards at a speed of 33.47% to restore the long run equilibrium position.

The independent variables individual adjustment speed rates back to their own long run equilibriums were found to be 39.51%, 26.91%, 5845277626.51% and 35.65% for external debt, domestic debt, debt service and exchange rate respectively. All the three explanatory variables were found to have dropped below their own individual long run equilibriums, and the VECM results show that they are expected to increase at their respective adjustment speed rate to restore their own individual long run equilibrium.

Findings also revealed that debt service was found to have very high adjustment speed rate such that its deviations from the long run equilibrium position are adjusted swiftly and rapidly such that they may pass unnoticed. Further findings indicated that debt service does not have a significant relationship with economic growth in the short run.

Debt service was found to have very high adjustment speed rate such that its deviations from the long run equilibrium position are adjusted swiftly and rapidly such that they may pass unnoticed. Debt service does not have a significant relationship with economic growth in the short run.

Both domestic and external debts were found to have no significant relationship with economic growth in the short run. Only exchange rate had a significant short run relationship with GDP in the short run.

Granger causality results indicated that there exists a uni-directional relationship between external debt and domestic debt implying that external debt causes domestic debt but domestic debt does not cause external debt. Further, external debt service was established to granger cause exchange rate and not vice versa.

The study findings also indicated that in the first decade, that is the first decade from independence, changes in GDP were largely due to its own variations which stood at 100% and the predictor variables (external debt, domestic debt, debt service and exchange rate) didn't contribute to the changes in GDP. Other findings indicated that The in the subsequent decades, the changes in GDP were still largely attributed to itself while external debt, domestic debt, debt service and exchange rate contributed less to GDP. As the years progressed, the contribution of the predictor variables to GDP increased to more than 5%. In the final decade which is between the year 2005 and the year 2015, the results reveal that the changes in GDP were largely contributed itself and other factors other than the external debt, domestic debt, exchange rate and external debt service as indicated by 79.2%.

5.3 Discussions

The first objective of the study was to assess the effect of external (foreign) public debt on economic growth in Kenya. Multiple regression analysis indicates that economic growth is negatively and significantly related to external debt. The findings agree with the findings of Reinhart and Rogoff (2010 and 2012) who showed that high levels of external public debt are negatively correlated with economic growth.

Furthermore, in the long run, the external debt had a long run negative insignificant relationship with GDP. In the short run, external debts were found to have no significant relationship with economic growth in the short run. The findings don't agree with Mustafa (2010) who indicated that long run significant effect of external debt

on economic growth. The findings however agree with Shah and pervin (2010) who revealed that in the long run, debt service has a negative effect on GDP

The second objective of the study was to determine the effect of internal (domestic) public debt on economic growth in Kenya. The results indicated significant and negative associations between GDP and domestic debt. Multiple regression analysis indicated that economic growth is positively and significantly related to domestic debt. This is supported by Gikandu (2012) who found that there existed a weak positive relationship between the two variables meaning that the use of domestic debt has some slight contribution to economic growth.

In the long run, domestic debt had a long run positive insignificant relationship with GDP. In the short run, domestic debts were found to have no significant relationship with economic growth. The findings of the study agree with the findings of a study by Chironga (2003) and Schclarek (2004) who concluded that there is a negative relationship between domestic debts and economic growth. The findings also agree with Patillo, Romer and Weil (2004) who concluded that at low levels of domestic debt affects economic growth positively, while at high levels, this relationship becomes negative.

The third objective of the study was to establish the effect of total public debt servicing on economic growth in Kenya. The association between debt service and GDP was positive but not significant. The findings agree with the findings of studies by Heavily Indebted Poor Countries (HIPC) (2001) as well as Schclarek (2004) who found no adverse impact of debt servicing on economic growth. The association between debt service and GDP was positive and significant. Multiple regression analysis indicated that economic growth is negatively and significantly related to exchange rate. In the long run, debt service had a positive and significant long run relationship with GDP while in the

short run debt service had no significant relationship with economic growth. These findings are supported by findings of a study by Makau (2008) which indicated that in the long run , the coefficients of debt service to GDP were significant. Furthermore, debt service was established to granger cause exchange rate and not vice versa.

The fourth objective of the study was to estimate the effect of exchange rate as a control variable on economic growth in Kenya. Exchange had a negative and insignificant association with GDP. The findings don't agree with the findings of a study by Polodoo et al (2007) which indicated a positive impact on economic growth. Multiple regression analysis indicated that economic growth is positively and significantly related to debt service. The findings agree with Azee et al (2012) debt service contributes positively to economic growth. In the long run, exchange rate had a negative insignificant relationship with GDP but in the short run it had a significant short run relationship with GDP.

5.4 Conclusions

The study sought to establish the effects of public debts on economic growth in Kenya. The study concluded that economic growth is negatively and significantly related to external debt. Furthermore, there is a significant and negative association between GDP and domestic debt.

The findings of the study also led to the conclusion that economic growth is positively and significantly related to domestic debt. In the long run, domestic debt has a long run positive insignificant relationship with GDP. In the short run, domestic debts have no significant relationship with economic growth.

The study also concluded that the association between debt service and GDP is positive but not significant. The association between debt service and GDP is positive

and significant. Furthermore, exchange rate has a negative and insignificant association with GDP.

The study also concluded that by studying the past values of public debts, it is possible to predict future GDP. The changes in economic growth have majorly been caused by itself and not the four predictor variables in the study.

Furthermore, these results from this study give mixed results as compared to the findings of other studies. This further indicates that the topic of how public debts and economic growth are related is still an open topic of research in future.

5.5 Recommendations

In light of the results and conclusions discussed in the foregoing paragraphs, the government and policymakers in Kenya should consider the following recommendations to improve public debt management. First, the governments should establish and adopt an optimal balance between external and domestic debt to maintain steady economic growth. Although domestic debt had no significant effect on GDP in the short run and a positive effect on GDP in the long run, it cannot be relied on entirely since a rapid increase in borrowing locally has the potential of crowding-out private investments.

Second, the negative effect of exchange rate on economic growth is a signal to the central bank and Policy makers that they need to stabilize the local currencies for instance by improving exports. Since debt service causes exchange rate, proper management of debt service is hence a key priority for the government.

The study also recommends that prudential fiscal management measures are required to avoid an unnecessary increase in overall public debt. A reduction in borrowing will enable the country to use a greater proportion of their tax revenues for investments rather than repaying loans, thereby increasing economic growth.

Furthermore, real exchange depreciation raises the debt burden and negatively relates to GDP. There is thus the need to ensure that exchange is not over-devalued in order to balance two effects.

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Appendix: Secondary Data collection template

Year	Real GDP growth rate	External debt	Domestic debt	Debt service	Inflation rate	REER