EFFECT OF EXTERNAL DEBT AND INFLATION ON ECONOMIC GROWTH IN KENYA

By

VINCENT O. OSEWE

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTERS OF SCIENCE IN COMMERCE IN THE SCHOOL OF BUSINESS STUDIES AND PUBLIC MANAGEMENT AT KCA UNIVERSITY

NOVEMBER, 2013

DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference I made and author dully acknowledged.

Student Name: Vincent Otieno Osewe Reg, No: kca/07/00506

Sign: Date:

I do hereby confirm that I have examined the master's dissertation of

Vincent Otieno Osewe

And I have certified that all revisions that the dissertation panel and examiners recommended have been adequately addressed.

Sign: Date:

DR: GEORGE KOSIMBEI

DISSERTATION SUPERVISOR

EFFECT OF EXTERNAL DEBT AND INFLATION ON ECONOMIC GROWTH IN KENYA

ABSTRACT

The state of economic growth in Kenya has been fluctuating over time as a result of various factors. This study was carried out using external debt and inflation rates as some of the variables which can impact economic growth. The purpose of this research was to investigate the effect of external public debt and inflation in Kenya. It also aimed at identifying other factors that can affect economic growth in Kenya. The specific objectives for the research were to determine the effect of external public debt level on economic growth in Kenya, analyze the effect of inflation on economic growth in Kenya and to establish whether external public debt level and inflation cause economic growth in Kenya. The methodology used during the research included secondary data from International Monetary Fund (IMF), International Financial Statistics (IFS) and Central Bank of Kenya (CBK) data. The study used econometric models in establishing the relationship among the variables. Johansen Cointegration test, Granger causality test and Vector Error Correction model were used using STATA statistical software. The research found that external debt and inflation had no impact on GDP and that there exists a cointegrating relationship among these variables hence they are moving together in long run. The test for granger causality indicated that there was no causal linkage among the variables.

Key Words: Gross Domestic Product, External Debt, Inflation, Cointegration, Granger Causality, Stationarity, Vector Error Correction

ACKNOWLEDGEMENT

I sincerely extend my gratitude to my Supervisor Dr. George Kosimbei for the devoted time he accorded me and working tirelessly to ensure that we have our final dissertation on time

My special gratitude also goes to my wife Nancy Mireri, my son Mr. Renson Otieno and my parents for their corporation throughout my research period

I would also like to acknowledge the effort I received from friends and advisors especially Dr. Christine Nanjala for her enormous advice and contribution towards ensuring that the dissertation was a success

Lastly I thank the Almighty father for good health and strong ability he has accorded me throughout my study and life

TABLE OF CONTENTS

DEDICATION

I dedicate this work to my parents Mr. & Mrs. Fredrick Osewe and to my brothers and sisters for their support, encouragement and contribution towards my education. You are just a great comfort to my life!

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

IDA: International Development Association

ADB: African Development Bank

WB: World Bank

IMF: International Monetary Fund

IFS: International Financial Statistics

KENDREN: Kenya Debt Relief Network

GDP: Gross Domestic Products

OECD: Organization for Economic Corporation and Development

ODA: Official Development Assistance

PPP: Purchasing Power Parity

RVP: Relative Price Changes

CBK: Central Bank of Kenya

R & D: Research and Development

ADF: Augmented Dickey Fuller

GDP: Gross Domestic Product

VAR: Vector Auto Regression

VEC: Vector Error Correction

OPERATION DEFINITION OF TERMS

External Debt:	This is the total debt that a nation owes to creditors outside the country
Inflation	This is an increase in the price level of services and goods within an economy for a given period of time
Exogenous variable	This is an independent variable that affects a model without being affected by the model
Endogenous variable	This is a variable generated by a model that is explained by the relationship between functions within the model
Spurious Results	Results without authenticity or validity

CHAPTER ONE

INTRODUCTION

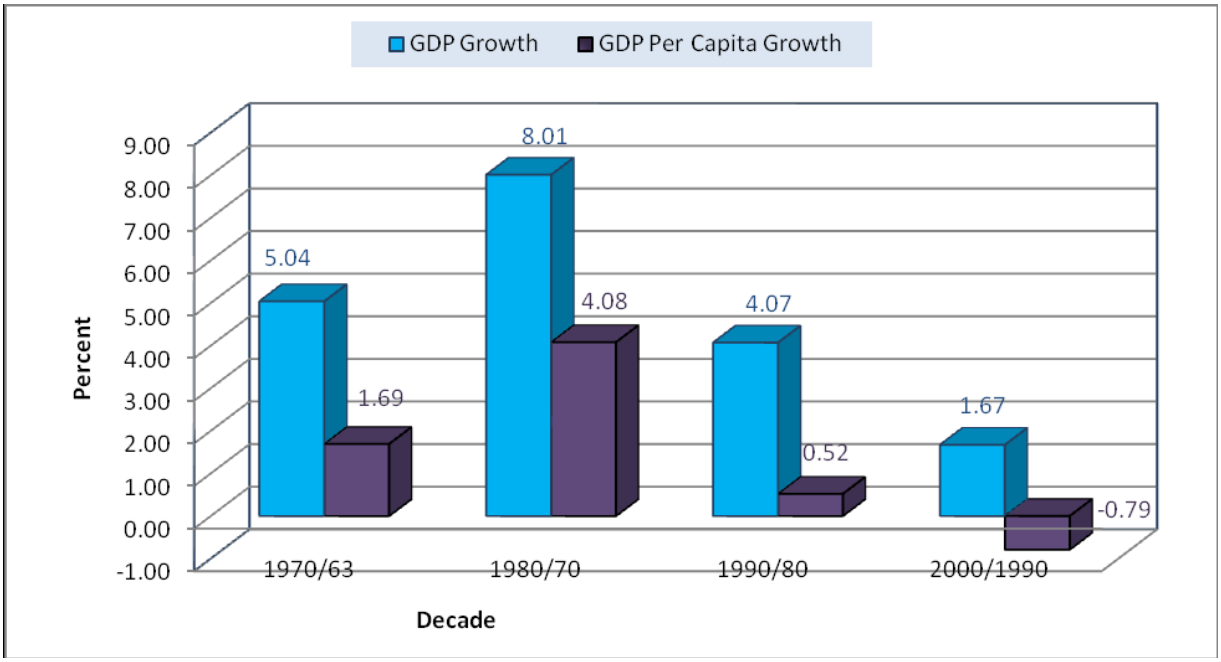
1.1: Background

Kenya as a country has not attained a continuous economic growth duration for a long period of time. The Kenyan growth rate has been fluctuating from 1960s with more economic growth rates being noticed in 1960s and beginning of 1970 before economic performance started declining in the mid-1970 (Person and Tabellini, 2001). By 1990s, the economy and the GDP per capita were reducing, and this state continued up to the year 2002. As of 2009, Kenya's Growth Domestic Product (GDP) was 29.5 billion and the annual growth rate stood at 3.6 percent (Barr, 2011). The number of people living in poverty increased from about 48.8 percent in 1990 to more than 56 percent at the end of 2002 with some parts of the country having much higher poverty levels. Social indicators worsened markedly between 1980s and the year 2002. For instance, according to Kenya Demographic and Health Survey, 2003, infant death rate increased from 96 per thousand births to 114 per thousand births in the same period and life expectancy declined from 57 years in 1986 to 47 years in 2000.

This fluctuation resulted into development of Kenya Economic Recovery Strategy for Wealth and Employment Creation (ERS) in 2003. This subsequently led to recovery of Kenyans economy especially in 2007 when the economy was estimated to be on rapid growth trajectory of 7 percent which was much better as compared with 0.6 percent in 2002. The GDP growth rate was highest at 8.01 percent per annum in 1970s before declining in the subsequent years (KIPPRA, IEA & IPAR, 2000).

In the 1980s the growth momentum started reducing and by 1990s GDP growth was very low that GDP per capita was declining, a situation that remained steady over time up to the year 2002. GDP growth rate was on an average of 4.07 percent per year in 1980s however the performance reduced further to a growth rate of merely 1.67 percent in the 1990s (Njuguna and Kamau, 2008). The per capital income was gaining at a highest value of 4.08 percent in 1970s but changed to a negative growth of 0.79 percent in the 1990s as shown in figure 1.

Figure 1: GDP growth rate per decade



Source: Kenya Economic Survey data

On the other hand the public debt rose highly over the past periods and this trend was accompanied by an expansion in the size of governments. In most industrial countries, the growth rate of general public expenditure was enormous in the 20th century. The size of government for thirteen industrial countries increased from 12% of Gross Domestic Product in

1913 to 43% of Gross Domestic Product in 1990 (Tanzi and Schuknecht ,1997). Towards the end of the period, average government debt-to-Gross Domestic Product ratio was 79% in large governments, 60% in medium-sized governments and 53% in small governments. The way in which debt accumulates can be important from the perspective of its economic impact and the subsequent strategy adopted by governments to be used for the exit purpose. Reinhart and Rogoff (2010) in their research argued that war debts may have low impact for future growth since the high war-time government spending comes to a halt as peace resumes, while peacetime debt explosions may be persistent for a long period of time.

1.2: Public Debt level and GDP in Kenya

The evidence of highly increasing level of debt producing a negative impact on economic development was noted in the first United Nations Development Decade (World Economic and Social Survey (WESS), 2005). Even though the developing nations attained minimum target of annual growth of GDP of 5 percent easily by 1970s, nearly about half of official foreign – exchange receipts were used for the purpose of repaying debt to official lenders. The reduction in official government cash flows during the period made debt servicing very difficult thereby necessitating debt rescheduling for the governments.

The continuous reduction in official assistance and increasing level of multilateral assistance in the poorer and developing nations especially in the sub -Sahara Africa together with a rapid increase in the private sector liquidity because of expansion of the Eurodollar market during the beginning of 1970s resulted into an increase in private sector borrowing by a number of rapidly growing developing countries. The International Monetary Fund (IMF) was highly associated with official debt negotiations by giving estimates of the borrower's ability to pay and stand by

programme to nations in debt renegotiations. The purpose of IMF was to determine an estimate of the borrower's external financing gap and the provisions for current standby credit to finance it. This was subjected to the introduction of an external adjustment programme which was to ensure that the gap could be eliminated and to allow the country to return to debt servicing. Due to the increase in problems associated with debt in the 1970s, both the private creditors and the IMF came up with statistical techniques aimed to identify factors that could signal a specific need for debt restructuring. Lee (1993) identifies the indicators of debt rescheduling as the ratio of debt service to Gross Domestic Product and to reserves together with the ratio of debt to exports and to Gross Domestic Product.

Kenya's debt level has been increasing over the last ten years. For instance, the nation's extrenal debt level increased from Ksh. 466,294 million to Ksh. 789,076 million representing 67.8 percent and 50.5 percent of GDP for June 1996 and June 2006 respectively. Private debt rose from Ksh. 120,355 million to Ksh. 345,939 million (17.5 percent to 27.6 percent of Gross Domestic Product) in the same time (Njuguna, Kamau & Owino, 2008).

The composition of external debt level has also significantly changed with the share of private debt increasing from 25.8 percent of total debt in Kenya as at the end of June 2005. The ratio of external debt in total debt in Kenya fell from 74.2 percent to 57.9 percent in the same period, Annual Public Debt Report (2005/06). According to the report, this shift was mainly attributed to reduced access to external funding. However, despite the rise in the stock of debt in the period, the share of overall debt to GDP declined mainly due to faster growth in the GDP as compared to debt.

External debt declined by Ksh. 3,215 million or 0.7 percent from Ksh. 434, 453 million at the end of June 2005 to Ksh. 431,237 million at the end of June 2006. The comparison of public debt in Gross Domestic Product fell from 32.2 percent to 26.6 percent during the same time while that of external debt to total debt fell from 57.9 percent to 54.7 percent (Public Debt Management policy, 2007). The debt level however increased from US Dollar 5,701 million to US Dollar 5,837 million due to appreciation in Ksh. against US Dollar.

The public debt (external) owed to both multilateral and bilateral creditors was Sh. 255,550 million and Sh. 154,877 million respectively as at the end of June 2006. This was 59.3 percent and 35.9 percent of total external debt respectively at the end of June 2006 as compared to 58.9 percent and 36.3 percent for the previous year. The total debt which Kenya owed to commercial creditors was Ksh. 1,274 million or 0.3 percent of the total external debt. The total credit suppliers was Ksh. 19,536 million (4.5 percent of external debt) at the end of June 2006.

1.3: Legal Framework and Strategies of External Debt

In Kenya, there are four different however related Acts of Parliament which govern public debt management (Annual Public Debt Report (APDR) 2007). The Acts include the External Loans and Credit Act (Cap 422), the Internal Loans Act (Cap 420), the Guarantee Loans Act (Cap 461) and the Central Bank of Kenya Act (Cap 491).

The External Loan and Credit Act (Cap 422) empower the ministry of Finance to negotiate the loans together with conditions used to contract external loans and credits for Kenya. Currently the ceiling for external debt stock of is Ksh. 500,000 million as set by parliament in the year 2000. The Act gives power to the Minister of Finance by enabling them to borrow on behalf of

Kenyan government by directly issuing treasury bills and bonds to the domestic market. It also allows the Kenyan government access to an overdraft at the Central Bank of Kenya when there is a mismatch between revenue collected and the government expenditure. However, CBK puts a cape on the overdraft facility to 5 percent of the most current audited government revenue in order to control inflationary pressures arising from the use of the government overdraft facility. Guaranteed borrowing by Kenyan government corporations and local authorities is regulated under the Guaranteed Loans Act. The current limit for guaranteed borrowing set by parliament in 1993 was Ksh. 80 million.

Isaya, Raphael and Mutai (2008) noted that in spite of in availability of documented strategy for debt management, the yearly debt management report for the year 2005/6 highlighted the debt management strategy for the government. Key highlights on the strategy is to make sure that the level and the rate of growth of public debt in Kenya are sustainable over time, seeking more debt relief on a bilateral basis so as to give resources to basic poverty programs in the Economic Recovery Strategy Framework, thereby ensuring that the owed external debt stock level is within the limit authorized by the parliament and to continuously monitor and structure the debt portfolio so as to minimize debt servicing cost in Kenya.

1.4: External Debt Stock in Kenya

A report from Public Debt Management Report (2007) shows that external debt stock level reduced by Ksh. 3,215 million of 0.7 percent from Ksh. 431,237 million by end of June 2005 to Ksh. 431,237 million by end of June 2006. The ration of external debt stock to Gross Domestic Product fell from 32.2 percent to 27.6 percent in the period while that of external debt stock to

total debt fell from 57.9 percent to 54.7 percent. Debt stock in US dollar terms also increased from USD 5,701 million to USD 5,837 million. According to the report, this was attributed to appreciation of Kenya shilling against US dollar. External debt outstanding for both multilateral and bilateral creditors was highest as compared to commercial and supplier creditors. The largest multilateral creditor in Kenya was IDA followed by African Development Bank Group and then the European Investment Bank. Japan led in bilateral lending followed by France and Germany at 18.4 percent, 4.3 percent and 3.2 percent respectively.

1.5: External Debt Maturity in Kenya

Kenya's external debt is majorly long-term. Almost 97 percent had a maturity of over 10 years as at the end of June 2005 and June 2006. Approximately, a mere 3 percent of external debt level portfolio had a maturity of less than 10 years. This is in line with the government strategy for borrowing external debt stock on concessional terms. The highest value of external debt was contracted on Official Development Assistance (ODA) concessional terms according to Public Debt Annual Report (PDAR) 2007. The factor determining loan concessionality includes loan maturity, grace period and interest rates.

1.6: Inflation and Economic Growth

According to Aarstol (2000), the structure of maturity for private debt decreases as inflation increases. Klein (1975) found that the average maturity of newly issued US corporate bonds moved inversely with inflation in the 20th Century. This argument is supported by Leijohnhufvud, 1977, Gandolfi, 1982 and Miller, 1992 who attributes this inverse relationship to the chilling effect of the long term debt market. In their research, they postulate that credit

market participants are more competent in predicting inflation in case of short run inflationary circumstances as opposed to in long run inflationary circumstances. However no reason is expressly given to explain this relationship.

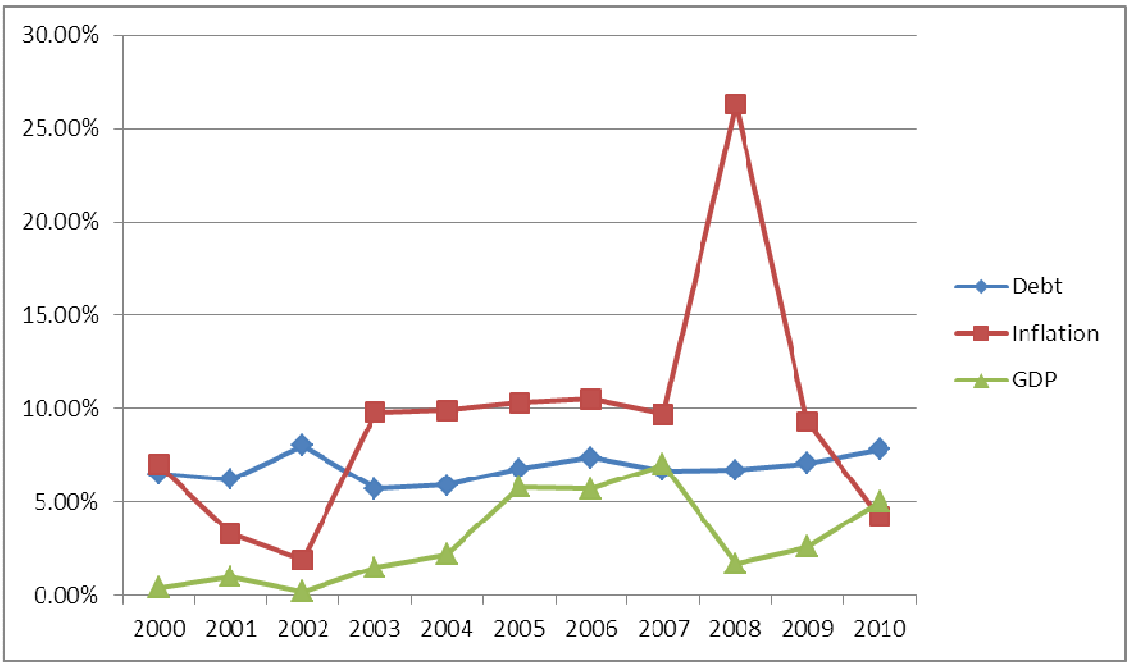
Aarstol (2000) attributes this relationship to Relative Price Changes (RPV). In his research he argues that volatility of relative price changes will increase with increase in inflation. An increase in RPV causes a focus towards short term sources of finance in terms of debt. The notion of negative correlation for inflation variable and debt variable maturity is not explained by the RPV on that accompanies inflation was also found to be significant in his research. Therefore the negative correlation between debt maturity and inflation is as a result of the impact of Relative Price Changes on the risk incentive problem.

Inflation is generally accepted as increase in price of a product or service over time for a particular period of time. The major factors causing inflation include cost push inflation which will occur as businesses respond to increasing production costs by increasing prices so as to maintain their profit margin, (Words and Tutor, 2009). Research by Geyser and Lowies (2001), indicates that economic events and key economic variables affect economic performance. Inflation is therefore one such key economic variable that will affect economic growth in Kenya.

Against this backdrop, a question arises on the impact of this high and potentially persistent external debt and the ever volatile rates of inflation on the Kenya's economic growth. As the economic growth rate creates a linear negative effect on the public debt-to-Gross Domestic Product ratio, high levels of government debts are likely to be of negative impact to economic

growth, Masson (1998), and Schclarek, (2004). The same research also pointed out that the effect of inflation is non-linear since it becomes relevant only when a certain level of inflation has been attained. This research will analyze the effect of external government debt and inflation to Gross Domestic Product growth in Kenya. The trend of inflation, external debt and GDP is presented in figure 2 below;

Figure 2: Debt, Inflation and GDP



Source: International Monetary Fund

1.7: Problem Statement

Several studies have been carried out on effects of external debt and economic growth including a research study on domestic debt and its impact on the economy in Kenya by Isaya, Raphael and Mutai (2008). Masson (1998) and Schclarek (2004) carried out a research on impact of government debt on per-capita Gross Domestic Product growth in Kenya from 1996-2005, Ajayi and Iyoha (1998) concerning the issue of debt and lack of growth, and Amassoma (2011) on how debt stock and crushing debt service burden have introduced a vicious circle to the analysis of development problem of the developing countries because debt servicing in the face of inadequate foreign earnings leads to severe import strangulation, which holds back export growth thereby perpetuating import shortages as held by (Ajisafe et al, 2006).

However, there is little research done to directly investigate the effect of external debt stock and inflation on economic growth in Kenya. There is considerable increase in the level of external debt in Kenya and ever surging and volatile rates of inflation which tends to fluctuate economic growth in Kenya. Impact of increasing levels of public debt stock level on economic growth is of great concern to most developing countries (Thugge et al, 2008). Policy makers around the world generally recognizes that very high level of debt contribute to limit the development of these countries despite the fact that lending to these countries occur at concessional rates. This notwithstanding, inflation rates are highly volatile resulting into possibility of reduced domestic money holding hence reverting to external debts (Klein 1975). Many areas concerning public debt and economic growth in Kenya have been put into forecast overtime. This research study therefore investigated on the impact of external debt stock level and inflation on economic growth in Kenya.

1.8: General Objective

The general objective of the study was to investigate the effect of external debt and inflation on economic growth in Kenya.

1.9: Specific Objectives

The specific objectives for the study were to;

1.9.1 Determine the effect of external public debt level on economic growth in Kenya

1.9.2 Examine the effect of inflation on economic growth in Kenya

1.9.3 Establish whether external public debt level and inflation cause economic growth in Kenya

1.10: Research questions

1.10.1 What was the effect of external public debt level on economic growth in Kenya?

1.10.2 What was the effect of inflation on economic growth in Kenya?

1.10.3 Does external public debt level and inflation cause economic growth in Kenya?

1.11: Significance of the Study

This research will provide an insight to the level of external debt, inflation and the growth rate in terms of GDP in developing countries specifically in Kenya. The research will be of great use to many stakeholders by providing information which may be helpful for decision making with respect to economic growth.

Matters of public debt whether external debt or domestic debt are of great concern to every government as this affects the government projects and its development policies. From the research the government can know the relevance of external debt and inflation to projections especially regarding economic growth.

According to (Kenya Debt Relief Network (KENDREN), 2009), report on the Kenya's Public Debt Status, the information on Kenya's public debt burden continues to create negative effect. By August 2008, the public debt stock was valued at Ksh. 867 billion in Kenya which is a country comprising a population of 36 million people. This meant that every Kenyan bears a debt burden of Ksh. 24,083. It further noted that repayment of external debt servicing cost, interest, is the first deduction on the Kenya's tax revenues.

This research will provide an analysis into the likely scenarios of this persistent debt burden to Kenyan's and the likely projections to future developments.

1.12: Scope of the Study

The study investigated the effects of external public debt and inflation on economic growth using annual reports on public debt and inflation in Kenya for the past 41 years. Other information will be sourced from International Monetary Fund and International Financial Statistics.

1.13: Limitations of the Study

This research study was limited to three variables affecting economic growth. This was because other key factors affecting economic growth like technology and agriculture, rate of import and

export and political factors among other are not put into account. This however opens opportunity for further research using the omitted variables.

CHAPTER TWO

2.0: Introduction

This chapter discusses theoretical and empirical literature concerning the research study

2.1: Conceptual Framework

According to Oke (2012), various theories have been discussed by scholars in an attempt to explain the subject external debt and economic growth. However, most theoretical literature concerning the relationship between government debts and economic growth tend to give a negative link between the public-debt-to –Gross Domestic Product ratio and a constant state- of growth of GDP per capita (Checherita, 2012). A research by Aizenman et al (2007), indicate that a number of endogenous growth models indicate that a positive effect is possible in the transmission stage to steady-state. This however depends on the types of public goods which are financed out by the public debt or up to some levels when debt is used to finance productive public capital.

The major issue to be explained is on whether the large burden of debt is among the variables which result to weak economic performance together with the un-even rate of economic reforms in the developing counties. There are three theories which can be used in this perspective:

2.2: The Dual Gap Analysis Theory

This theory holds that development is a function of investment which requires domestic savings. It explains that development is a function of investment and that such investment, which require domestic savings, are not enough to ensure that development takes place (Oke, 2012). There must be possibility of obtaining from a broad the amount that can be invested in any country

which is identical with the amount that is saved. If domestic resources are to be supplemented, from a broad, such as excess of import over export, M>E,

$$I - S \quad 2.1$$

$$M - E \quad 2.2$$

Hence $I - S = M - E$ 2.3

Where I, represents Investment

S represents Savings

M represents Imports and

E represents Exports

In national income accounting, an excess of investment over domestic saving is equivalent to excess surplus of import over export.

$$Income = Consumption + Import + Savings \quad 2.4$$

$$Output = Consumption + Export + Investment \quad 2.5$$

$$Income = Output \quad 2.6$$

Then $Investment - Savings = Import - Export$ 2.7

Thus dual gap analyses assure that there is a country that requires savings and investments goods import to achieve a particular rate of growth. According to Oke, (2012) If the available domestic saving fall short of the level necessary to achieve the target rate of growth, a savings investment gap is said to exist on a similar note, if the maximum import requirement needed to achieve the

growth target are greater than the maximum possible level of export, then this is an export – import of origin exchange gap.

2.3: The Debt Overhang Theory

This theory is based on the argument that if debt exceeds the countries repayment ability with some probability in the future expected debt service is likely to be an increasing function of the country's output level. Thus some of the returns from investing in domestic economy are effectively 'taxed' away from existing foreign creditors and an investment by domestic and new foreign investors is discouraged (Claessens et al., 1996). Were (2001), argues that in the above conditions, the debtor country shares only partially in any increase in output and exports because a fraction of that increase will be used to serve the external debt. The implication in this theory is that debt reduction will lead to increased investment and repayment capacity and as a result the position of the debt outstanding becomes more likely to be repaid. When this effect is strong, the debtor is said to be on the 'wrong side' side of the Luffer curve.

Debt Luffer curve is the relationship between the level of debt servicing cost and the size of the debt. The idea of the debt Luffer curve also holds that there is a limit to which debt accumulation brings about growth (Elbadawi et al., 1996). Lensink and White (1999) also made reference to debt Luffer curve and concluded that there is a level at which more public debt is of negative effect to growth.

2.4: The Liquidity Constraint Theory

This is captured as a crowding out effect, where the requirements to repay debt interest cost reduces funds available for investments and growth. Any decrease in the current public debt service could lead to an increase in the current investment for any given level of future indebtedness (Cohen 1997). Other areas in which the need to service a large amount of external debt obligations could have a negative effect on economic performance include lack of access to internal financial markets and the effects of the debt stock on the general level of uncertainty in the economy (Claessens et al., 1996)

2.5.0: Economic growth Models

The theories on external debt and economic growth discussed above present three models of economic growth as discussed below;

2.5.1: Harrod Domar Model

Harrod and Domar took an approach of economic growth stemming from Keynesian framework which was extended to long run to analyze the requirement to maintain full employment for a long period of time. This model holds that to continue with full employment, economy needs to invest the amount of savings from full employment income yearly with full utilization of production capacities and capital formulation has to be put together with the growth of labour force. Domar (1957,6), holds that Keynes's peculiar treatment of process of investment must be recognized. This means that investment generates both income (as in Keynesian multiplier analysis) and also raises the productive capacity of the economy. The increase generated appears on the demand side and is short run in nature while the economies productive capacity is long

run effect. Therefore every positive net investment (I) has a capacity enhancing effect hence increment of investment leads to increase in income (Y).

Keyne's growth model explains business cycles in a short run phenomena hence attributing major part to aggregate expenditures representing the demand side on supply, Keynes assume that there is unemployment hence production responds fast to increase in aggregate demand because capital and labour is unemployed. The aggregate demand, AD is determined by;

$$AD = C + I + G + X - m \qquad 2.6$$

Where C, Consumption expenditure

I, Investment expenditure

G, Government expenditure

X-m, Foreign expenditure

The aggregate supply AS< aggregate supply at full employment ASfe

At macro-economic Equilibrium

$$AS = AD \text{ OR } S = I \qquad 2.7$$

However, Keynesian economic growth model take a long run perspective. The Aggregate demand (or savings equals Investment), but it also includes the aggregate supply hence investment has two impacts; on expenditure (in short run) and on capital stock (in the long run).The model therefore holds that economic growth can be increased by changing the savings rate and improving technology. Therefore according to Harrod Domar model, factors explaining the growth rate are savings (positive impact), capital productivity (positive impact) and capital depreciation (negative impact).

According to this model, the rate of economic growth is determined by;

$$g = S.a - d \quad (2.8)$$

Where; S, Savings

a, Productivity of capital

d, Depreciation

Using the savings function (demand side)

$$S = s.Y \quad (2.9)$$

S represents the average savings rate or average propensity to save.

However for the case of short run, Keynesian model investment (I) is given by;

$$I - Ia \quad (2.10)$$

In equilibrium

$$S = I$$

Solving the model

$$s.Y = Ia \quad (2.11)$$

$$Y = \frac{I}{S}.Ia = m.Ia \quad (2.12)$$

Where m is the investment multiplier

The country's Gross Domestic Product increases because the autonomous demand, Investment, will increase. It is generally taken that aggregate supply responds so as to produce the aggregate demand in the economy. Therefore the best way for production to increase is when there is an

increase in the capital stock. When there is more capital, the economy produces more Gross Domestic Product.

2.5.2: Solow's Growth Model

This model was developed by Solow, (1956) where he criticized Harrod Domar model analyzing long run problems using short run classical analysis. The model assumes that there is single good, which is produced in the economy, consumed and saved. A given part of income is consumed while the rest is saved. However, since the economy is a closed, saving will be equal to investment. According to Solow (1956), the change in capital for given periods is taken to be investment.

Thus $\frac{dk}{dt} = k = sY$ 2.14

The good is produced by using labor and capital hence production function using

Y=F (K, L). This brings into focus the neo classical model assumptions used by Solow;

i. All K>0 and L>0, Y=F (K, L) exhibits positive and diminishing marginal products with respect to each input.

ii. Y=F(K,L) exhibits constant return to scale

iii. The marginal product of capital (or labor) approaches to infinity as capital (or labor) goes to 0 and approaches 0 as capital or labor goes to infinity (Inada conditions)

By applying the aspect of constant returns to scale,

$$Y = F(K, L) = LXF\left(\frac{k}{l}, \mathbf{1}\right) = Lxf(k) \quad 2.15$$

Where k = Per capita capital K/L

Y = Per capita income Y/L. This means that

$$Y = f(k) \qquad 2.16$$

Equation I can also be expressed as K/L = sf(k) 2.17

Using per capita capital (k),

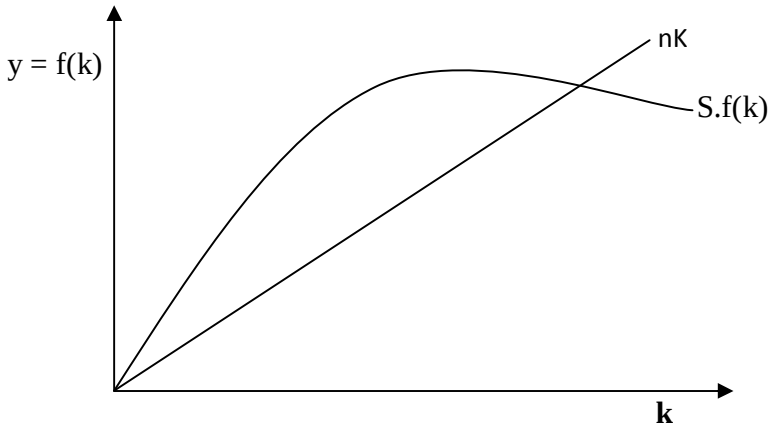
k= K/L ➔ k=kL + Lk ⟶ K/L = k + Lk/L 2.18

On assumption, Solow, (1956), each individual in a population is a member of the labor force and the growth rate of the population, L/L is n. This can be substituted in equation v as follows;

$$s.f(k) = k + nK$$

$$k = S.f(k) - nK \qquad 2.19$$

This means that if per capita saving, s.f(k) is greater (smaller) than nk, then k will be positive. Thus k will remain the same when k is equal to zero (steady state of Solow's growth model) as shown below;



A study by Barro and Sala-i-Martin (1995), shows that a steady state is a level where all variables grow at the same rate. Solow's growth model indicates that economic output cannot grow faster than population over a long period of time due structure of the model being highly simplified.

2.5.3: Research and Development Model of Economic Growth

According to Roger (2008), in the beginning of neo-classical theory, knowledge was often considered as an exogenous variable which affects productivity in conjunction with company's input resources such as capital and labour. Romer (1990), indicates that in the case of endogenous growth theory, more investments in research and development which brings knowledge was seen as a crucial variable which explains growth together with high production. In this aspect, investments in research and development can result into long term growth and eventually lead to increasing returns to scale. Jones (1995) holds that common capital goods like machines and transportation means are rivalry products which should not be applied together during in the same period. However, knowledge is considered to be a non-rivalry product hence can be used without diminishing other company's use of products. Roger (2008) argues that some studies have projected the relationship between research and development in one area together with economic growth and productivity on the other areas that have considered usage of some form of productivity variable function with factors such as physical capital and labor determining productivity measured as value added or sales. However, R & D may not be easily determined on how it affects productivity since they are not considered like the exogenous component variables.

The level of investment in research and development usually rely on the level of expected sales volume making it cumbersome to determine the direction in which the causal link is headed. A

research done by Guilloches and Mairesse (1995) holds that this endogeinity problem results into estimates that are biased. Crepon (1998) attempted to estimate how and if companies invested in research and development and then tested the effect created by the estimated research and development on the production level. Ejermo (2006) investigated the effect on the private research and development at the aggregate level and concluded that there isn't any link existing between research and development and economic growth in less developed nations in spite of the common believe that less developed nations have more investment in research and development with regard to gross domestic products as compared to middle income nations as held by the study by Ree (1993) and Wolff (2001).

However, there exists a candid statistical relationship between research and development together with productivity in developed countries, with elasticity ranging from 0.13 to 0.20 which implies that increase in research and development with 1 per cent, leads to production increasing with equivalent of 0.13 percent 0.20. In their research, Mansfield (1980), Griliches (1986), and Lichlenberg (1993), who concluded that research and development financed by the government had most week impact on the production with this relying highly on how research and development is funded. Guellec and Van Pottelsberghe (2004) after their investigation on the relationship between the different forms of research and development together with production in 16 Organisation for Economic Development (OECD) nations found that privately conducted research and development that is financed by the government had a very negative impact on production. In their study, they argue that in case public financing considers civil objectives, such as defense, the outcome on the level of productivity will be positive. By adopting Solow's growth model that growth depends on two variables (Capital and Labour) and analyzing the economic growth on long run, the research conceptualizes that external loan and inflation

influences economic growth. This study will therefore seek to determine the impact of external borrowing and inflation on economic growth.

Specifically, the study hypothesizes;

HI: External Debt together with Inflation have negative impact on economic growth such that if external borrowing and inflation increases, the economic growth will be affected negatively

2.6: Empirical Literature

Many researches which have more focus in the euro region analyze the effect of economic variables, which include public debt on long term service or their spread as compared to bench mark as another area which affect economic production (Checherita 2012).

According to Were et. al (2001), there has been minimum indications to empirically review debt overhang together with crowding out impacts. The empirical researches carried out encompass standard set for the domestic borrowing, exogenous variables together with policy variables. Majority of these attempts to come up with some borrowings variables which are significantly correlated or which are correlated negatively in relation to investment or in relation to growth but this depends on what the study focus on.

A study carried out by Borenszten (1990), concerning debt overhang, concluded that debt overhang has a negative effect in the Philippines in relation to investment (private). On the same study, Iyoha (1996) came up with similar findings and held that heavy borrowings burden have an impact of reducing investments as a result of the borrowings overhang and the crowding out effect. Research done by Cohen (1997) concerning the correlation for the developing nations' investments and borrowings indicated that the debt stock level does not show high significance

in explaining the reduction of investment in the developing nations in the course of 1980. The study held that the actual cash flows are the ones of high concern and therefore the cash flow used in repaying out ways the investments used for the debt together with the cash generated from such investments.

Using cross section regression for 99 Sub Saharan developing nations, including Middle East, Latin America, and Asia, Elbadawi (1996), also confirmed a borrowings overhang effect on the gross domestic product. The avenues identified where the level of debt in developing nations will be inversely related to the rate of development are considered to be the immediate borrowings' in flows against the proportion of gross domestic product (that could improve development) previous borrowings accumulated (which capture borrowings overhang), service ratio and the effect of the avenues above with reference to government spending. The research held that borrowings which are accumulated have a negative impact on growth while the borrowings levels have a positive effect on growth. According to Mbanga (2001), there is a borrowings overhang together with crowding impact on public investments and private investments respectively.

This implies that majority of researches do agree with both the crowding and borrowings overhang theories except that they focus more on the effect of external borrowing in investment and not effect of external borrowing on Gross domestic Product. Furthermore the researches above are based on data across countries rather than within a country itself. This research will therefore be on the effect of external borrowing on economic development (growth) especially in Kenya.

A study carried out by Christensen et al (2007) on desirable debt stock levels in less developed nations and emerging markets found that debt levels as a proportion of gross domestic product have a reasonable effect on development. The study noted that debt levels above 35 percent of total bank deposits have negative impacts on economic growth. Catherine, Poirson and Luca (2011) on their research on external debt and growth concluded that debt appears to have a non-linear effect on growth. The mean impact on borrowing in relation to per capita appeared to be negative where borrowings levels were above 160 to 170 as a percentage of exports and 35 to 40 as a percentage of gross domestic products.

A significant value of debt stock cash flows is anticipated to indicate a positive impact on development. Researches conducted indicate that high levels of debt stock accumulated lead to lower growth. Alesina and Tabellini (1989), Tornell and Velasco (1992) concluded that political and economic consideration may lead to excessive borrowing with lower growth, which usually comes along with flight of capital, especially when the cost of excessive tax to repay debt is not globalised. Borrowings overhang theories also indicate that in case of prospective that the future level of borrowings will be more than the ability of a country to repay, the expected cost of borrowing will be an increasing coefficient of the nations' level of output (Pattilo, and Ricci 2003). Perhaps, this confirms the findings by Krugman (1988) & Sachs (1989) that held that investment returns in a country are exposed to high tax levels by external lenders hence any current foreign or domestic investments are not encouraged.

Debt over hang theory has broader implications than just lower investments, since any form of investment which require investing costs currently to have desirable level of production in the

coming times will be not be encouraged because most of the returns from the investment will be reabsorbed by the lenders. Research by Pattilo, Poirson and Ricci (2003), asserts that the public sector will be having less courage for reforming the country especially in areas like fiscal adjustment and trade liberalization. High levels of debt stocks is also likely to generate anticipations that debts will be restricted, or that lending servicing cost will be funded negative taxation effects like corporate tax inflation or with reduction in the public investment productive capacity, (Agenor et el, 1996). This is likely to result into effect on growth through volume of investment, poor microeconomic policy and uncertainty on how volume of lending will be funded from the resources of a given nation.

The accumulated lending in the subsequent governments led by founding Kenyan president, President Moi and president Kibaki since Kenya attained her independence in 1963, continued to be excessive lending as minority not in government hope that there will not be any effect on them. The current excessive level of lending is an indication of many periods of poorly planned external lending and public money mismanagement within the country. This is evidenced with the scandals facing the current regime concerning fraud, embezzlement, looting, corruption and aspects of colluding with non existence institutions both local together with foreign institutions.

Even though there is poor country's governance with high levels of corruption which are being blamed for economic problems in Kenya, lending has reduced economic prospects and has made difficult the management of macroeconomic variables (KENDREN, 2009). Kenya has resorted to occasional debts over the years to fund the public costs. Surprisingly the more Kenya as a country continues to borrow, the more lending costs are paid and the more economic development is suppressed. The external debt interest costs paid by the country has deprived

Kenyan's their rights thereby impoverishing Kenyan's in several aspects. Interestingly, limits that the lender imposes on the country are to ensure that WB and IMF are repaid their money even at the expense of lifting Kenya out of poverty. This is because the terms imposed by these bodies bring more burden than solutions to Kenya hence the continuous increase in debt burden.

Kenya's public borrowing stock level has been skyrocketing in the last ten years, (Annual Public Debt Management Report (APDMR), 2007). The country's external lending increased as compared to the previous Sh. 466,294 million representing 67.8 proportion of gross domestic product by close of June 1996 well over to Sh. 789076 million representing 50.5proportion of gross domestic product as of June 2006. Notably, the comprising of public external lending has fluctuated highly with the level of domestic borrowing coming from 25.8 as a proportion of all lending as of June 1996 - 45.3 as a proportion as of June 2006. This change in the make-up of the borrowing at the time can be as a result of exposure to external financing from the country's agencies together with increasing domestic lending to bridge the gap perceived to be created from external lending.

CHAPTER THREE:

RESEACH METHODOLOGY

3.1 Introduction

This chapter gives a brief description of the methodology used in analyzing the data. It states the research design, instrumentation, model specification, data analysis and techniques and the model to be used for the analysis.

3.2 Research Design

The research used non experimental research design. This is because of the variables of study which the study did not have control of and were used without manipulation (Stone, 2010). The study analyzed the trend of annual economic growth as impacted on by annual external debt and annual inflation in Kenya. The study was both qualitative and quantitative due to the objectives of determining the effect that public debt and inflation have on gross domestic product of a country in Kenya.

3.3 Instrumentation

Data for this study was annual external debt level, inflation and nominal GDP from World Bank International Debt Statistics, Organization for Economic Development National Accounts Data files and World Bank national accounts data. This was appropriate since the research is descriptive in nature.

3.4 Model Specification

The model used was developed from Solow's economic growth model discussed in the previous chapter. Solow's economic growth model considers capital and labour as factors influencing productivity. The model is as shown below;

$Y=F(K, L)$.

Where Y represents Production

K represents Capital and

L represents Labour

This is because Solow's growth model analyses economic growth in long-term (Solow 1956). Modifications for the model yield the representation shown below;

$$GDP = f(Public\ Debt, Inflation) \quad 3.1$$

Due to existence of theories linking the above variables, the GDP was functionally explained by the explanatory macro economic variables falling to the right hand side. Further since the variables are time series, a time series regression model was fitted to analyze the variables.

3.5 Data Analysis and Techniques

To achieve the objectives of this study, annual time series data from the year 1970 to the year ending 2010, were used. The data was obtained from World Bank International Debt Statistics, Organization for Economic Development National Accounts Data files and World Bank national accounts data. This quantitative data was then summarized, and analyzed using STATA econometric software. The study used econometric models in establishing the relationship

between the variables. Johansen test for Cointegration and Vector Error Correction model were used using STATA statistical software.

3.5.1 Preliminary test

3.5.2 Test for Stationarity

Time series data is assumed to be stationary hence unit root test was performed to establish Stationarity of the variables. This is because use of non-stationary data leads to spurious results where test statistics exhibit a significant relationships between variables even when no such results exist, (Riman and Eyo, 2008). The Augmented Dickey Fuller (ADF Test), 1979 with the regression given below was used to determine Stationarity of the variables:

$$\Delta\gamma_t = \alpha + \beta\gamma_{t-1} + \sum_{j=i}^{k} + \lambda_j \Delta\gamma_{t-j} + \ell_t \qquad 3.2$$

Where Δ was the difference operator, γ_t represents series tested K was the number of the lag difference and ℓ_t was used as the error term. $\Delta\gamma_t$ was the change in a series under consideration with respect to the time period t, α is the constant term, β is the vector of coefficient on γ_{t-1}, λ_j was the lag and $\Delta\gamma_{t-j}$ are lagged changes.

The lag length was selected using correlogram of the residuals. Preliminary test included normality test and heteroskedasticity test so as to meet OLS assumptions. Residual analysis was used to determine normality of the data while Breusch-pagan test was used for heteroskedasticity.

3.5.3 Cointegration Test

Cointegration test was used to determine long term relationship for the variables. This was done using Johansen's procedure to determine whether there was cointegrating vector among variables (Johansen, 1990). The variables are cointegrated if the error term is stationary. The cointegration test was based on the equation below;

$$ER_t = \beta SP_t + \varepsilon_t \quad 3.3$$

Where ER_t represents the economic growth at time period t; β is the vector coefficient of external debt at time period t, SP is the inflation rate and ε_t is the error term. The two variables are cointegrated if the error term is stationary.

3.5.4 Granger Causality Test

This test was carried out to determine the causal linkage between the external debt, inflation and the economic growth. The test sought to explain how much of a variable can be explained by its own past values. The equations used were as follows;

$$SP_t = \sum_{t=1}^{n} \alpha_1 ER_{t-1} + \sum_{j=1}^{n} \beta_j SP_{t-1} + e_1 \quad 3.4$$

$$ER_t = \sum_{t=1}^{m} \lambda_1 ER_{t-1} + \sum_{j=1}^{m} \delta_j SP_{t-1} + e_2 \quad 3.5$$

Where SP_t represents the external debt at period t; ER_t is the economic growth at period t and e is the error term. Both the error terms are assumed to be uncorrelated. Equation 3.4 implies that the current SP is related to past ER and SP values. Equation 3.5 implies that the current ER is

related to past ER and SP values. The null hypothesis for equation 3.4 is: $Ho: \beta_j = 0$, which implies there is no causation from SP to ER. The null hypothesis for equation 3.5 is: $Ho: \delta_j = 0$ implying no causation from ER to SP. From the equations, the study analyzed the presence of unilateral causality from SP and ER or from ER to SP, presence of bilateral causality or whether ER and SP are independent of each other.

3.5.5 Vector Error Correction (VEC) Model

To analyse the effect of external debt and inflation on economic growth, Vector Error Correction (VEC) model was used. This was justified because VEC is a multiple time series model that estimates the speed at which dependent variable adjusts after being effected by an independent variable (Granger Engle and Clive, 1987). It also entails estimating equations where by the current values of each variable are expressed as a function of their lagged values and between or among the variables themselves (Orden, 1986). Further, VEC model is a theoretical model used to estimate both short term and long term effect of one time series on another.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.0 Introduction

This chapter gives a highlight of the data analysis results. The study began by investigating the characteristics of the data using descriptive statistics and visual aids. A basic analysis of the data was also done using multiple linear regression equation. The data was then tested for variance stability, Stationarity and Cointegration.

4.1 Descriptive Statistics

The descriptive statistics relating to external debt, inflation and GDP are presented in Table 1 below. Before regression analysis, the study began by transforming the data so as to get logarithm. This was to try and reduce the level of sparse. The basic transformed data used is presented in appendix 1. After the transformation, the study carried out linear regression analysis so as to ascertain whether the data met the OLS assumptions and whether the linear regression model can assist in the analysis.

The histograms for the transformed series of the data for the study are presented in appendix 1. The plots deviate from the normal implying that the series does not yield a normal curve. The graphical representations for the study are presented in figure 1, 2 and 3 in appendix 1;

Table 1: Descriptive Statistics

	Debt	**Inflation**	**GDP**
Mean	61614.17	9.97122	10610463
Median	40188	9.77	8151489
Maximum	167245	41.99	32198150
Minimum	0	-9.22	1603447
Std. Dev	51607.64	7.962206	8008554
Skewness	0.614179	1.424098	1.38323
Kurtosis	1.926553	8.270305	4.177242
Jarque – Bera	4.546132	61.30926	15.44196
Probability	0.102996	0	0.000443

4.2 Regression Analysis

Regression analysis has been used in some cases to analyze the effect of external borrowing and inflation on economic growth (as in the case of Ajay, 2012). In this case, external debt, inflation and GDP were modeled using this model. A multivariate regression model was fitted using the transformed series and the results from the model were presented as shown below;

Table 2: Regression Analysis results

GDP	**Coef**	**Std. Err.**	**T**	**P > |t|**	**[95% Conf. Interval)**	
Debt	0.2771383	0.165802	1.67	0.103	-0.05851	0.6127872
Inflation	0.3601507	0.24945	1.44	0.157	-0.14483	0.865135
_Cons	11.58895	5.274692	2.2	0.034	910899	22.26701

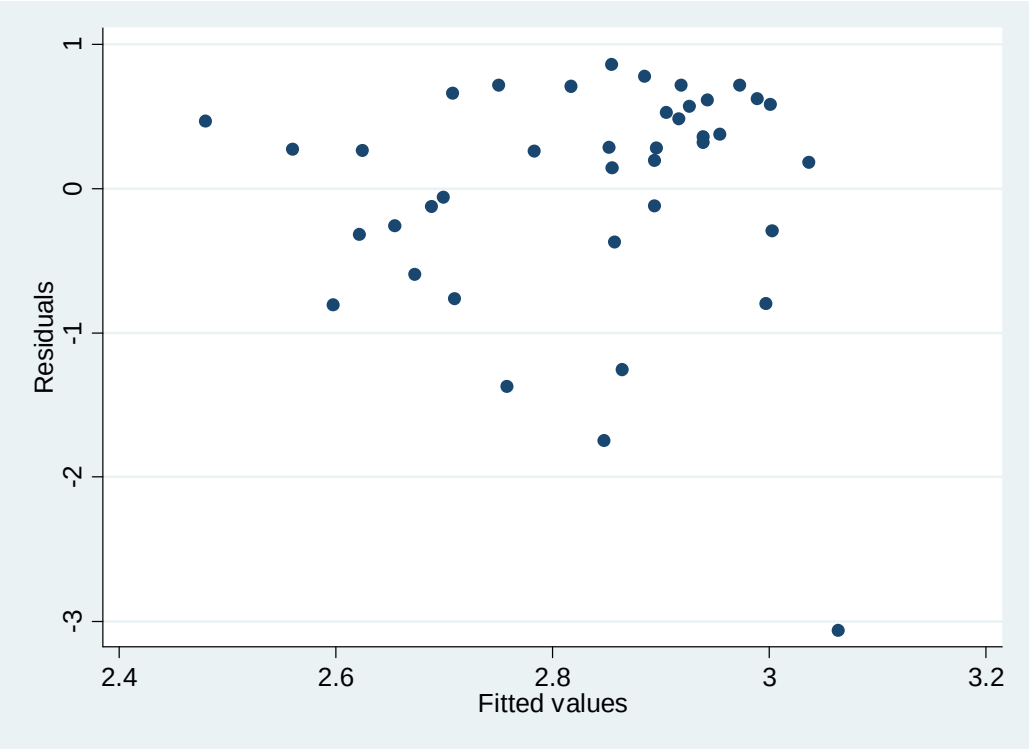
The theoretical expectation for the model coefficients was a negative coefficient for external debt and a negative coefficient for the inflation. The implication for this is that a unit increase in external debt level should reduce economic growth in Kenya due to the effect of excessive debt servicing costs in the economy (Checherita, 2010). However the study also recognized the fact

that some studies have pointed out a positive relationship with the level of external debt and the GDP. For instance Aizenman (2007) indicated that there are endogenous economic growth models which indicate that positive effect is most likely attained in a level of transmission stage up to steady-state, but this depends on the nature of public goods which are funded using debt or until a particular limit where debt can be used to fund productive capital of the public.

On the other hand, the results of inflation coefficient were also not consistent with our theoretical expectation. This is because increases in the level of inflation in most cases become deleterious to the economic growth. The unexpected relationship between GDP, external debt and inflation could be a pointer to problems in the model specification. As a result the study investigated the adequacy of the fitted regression model using model diagnostic tests.

The adequacy for the model was tested to see whether the assumptions of the OLS estimates were met by using residual analysis. The assumptions are that the residuals are random; there is linear relationship between dependent and independent variables, no serial correlation among the residuals and heteroskedasticity of residuals. The residual plot for the fitted values and the residuals were used to inspect the randomness of the residuals. Any apparent pattern should not be exhibited in the residual plots for the model to be a good fit. The residual plot shown below indicates lack of fit since the residuals are not random.

Figure 4: Residuals verses fitted Values



To check for serial autocorrelation, the study used Dubin Watson test statistic using transformed data. The dubin Watson d-statistic (3, 40) was 0.3926773. This was far from the centre of distribution hence the study confidently ascertained that there was a problem of serial autocorrelation. The study therefore rejected the null hypothesis that the d –stastistc =2. This signified presence of serial correlation in the data hence a further indication that OLS model could not be used. To test for normality, the study used Sharpro- Wilk test. The results were as shown in table 3 below;

Table 3: Sharpiro- Wilk Test

Variable	Obs	W	V	Z	prob>z
GDP	41	0.86807	5.315	3.521	0.00022
Debt	41	0.91008	3.554	2.669	0.00381
Inflation	41	0.86807	5.315	3.521	0.00022

From the results, the small p –value implied that the study should reject the null hypothesis of normality assumptions. Further, the study tested heteroskedasticity with the help of Breusch-pagan/Cook-weisberg test. Null hypothesis was that there was no heteroskedasticity, while the alternative hypothesis was that there is heteroskedasticity. After inputting all the predictors, the results were obtained as shown below;

Ho: Constant variance

Variables: Debt Inflation

chi2 (2) = 7.52

prob > chi2 = 0.0232

From the results above, it was clear that the study should reject the null hypothesis implying that there is heteroskedasticity. This compromised the effectiveness of using OLS model to analyze this data. In addition, the data is time series implying that OLS model could not be able to capture its dynamic relationship. The weaknesses of this model triggered the desire to use time series model which is more robust in capturing the dynamic structure of time series data.

4.3 Time Series Analysis

This section presents preliminary analysis for the data which aimed to determine if the data used was stationary or not. Time series plots, correlograms and Augmented Dickey Fuller tests were used. If the data is non stationary, the order of integration is usually determined before appropriate time series model is chosen to fit the data.

4.4 Testing for Stationarity

Non stationary time series data often results into spurious results since their estimates are considered to have non constant mean and variance. The first step was therefore to establish Stationarity for the data. Time series data is considered to be stationary when its mean, variance and co- variance are time invariant. This is commonly determined by using time series graphs. The time series plots for this study are presented in figures 5, 6 and 7 in appendix 1;

The results for the plots indicate a possible non Stationarity since their movement exhibit a trend. Using Augmented Dickey Fuller Test (ADF) test, the study embarked on checking whether GDP has unit root or not stationary. If not stationary, it must be made stationary by taking the first difference. The results for the tests with intercept only are as shown below;

Table 4: Stationarity Test with Intercept

	Test Statistic	**1% critical Value**	**5% Critical Value**	**10% Critical Value**	
Z(t)	-2.387	-2.387	-2.958	-2.612	
	Coef	Std. Err	T	p> | t |	[95% Conf. Interval]

The absolute value of t-statistic of -2.387 is smaller than the critical value at 5% confidence level of -2.958 hence the study couldn't reject the null hypothesis implying that the alternative hypothesis is true. Next the study checked the Stationarity using trend and intercept which generated the results as shown below;

Table 5: Stationarity Test with Trend and Intercept

	Test Statistic	**1% critical Value**	**5% Critical Value**	**10% Value**	**Critical**
Z(t)	-2.539	-4.242	-3.54	-3.204	

The absolute value of t-statistic of -2.539 is smaller as compared to the critical value at 5% confidence level of 3.540 hence the study could not reject the null hypothesis which still means that the alternative hypothesis was still true. Lastly the study checked the Stationarity using no trend and no intercept which generated the results as shown below;

Table 6: Stationarity Test without Trend and Intercept

	Test Statistic	**1% critical Value**	**5% Critical Value**	**10% Critical Value**
Z(t)	-0.728	-2.636	-1.95	-1.606

Since the absolute value of t-statistic of -0.728 was still smaller than the critical value at 5% confidence level of -1.95 the null hypothesis could not be rejected. To introduce the Stationarity, the study introduced first difference then checked unit roots for the above three variables. The results for the three variables were as shown in table 7, 8 and 9 in the appendix 1.

All the variables became stationary after the first difference which indicated that the variables were integrated to order one, I(1). This is because the study noticed that the absolute value of t-statistic in the three cases were bigger as compared to critical value hence it rejected the null hypothesis that the data was not stationary. After establishing that the variables are integrated to order one, the study moved to determine which multivariate time series model to fit.

4.5 VAR Model, VEC Model and Granger causality

After establishing that the variables are cointegrated to order one, the study had an option of fitting either vector auto regression model (VAR) to the differentiated series or vector error correction model (VEC). To determine the correct model to fit, the study sought to find out if the series were cointegrated. In case the series are cointegrated, fitting VAR model results in model misspecification. When the series are cointegrated, VEC model should be fit in order to reflect their short term and long term relationship.

4.6 Lag Selection

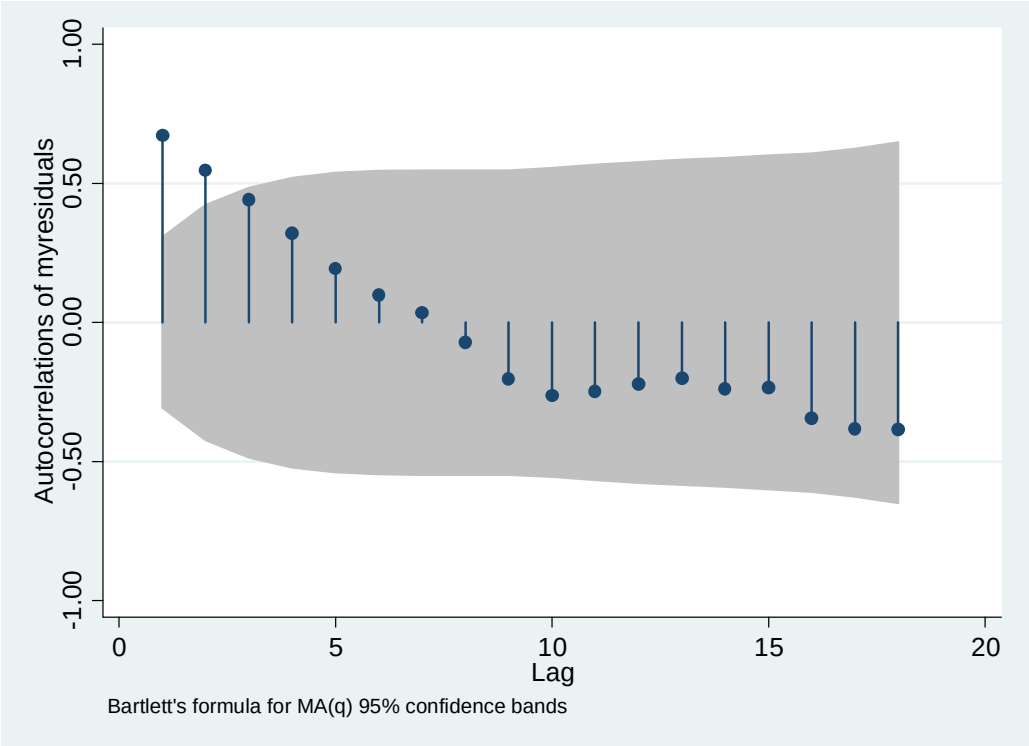
To ensure that the error term was not misspecified, the first step was to determine the lag length. The lag selection criteria available include; Sequential Modified Likelihood Ratio Criterion (LR), The Final Prediction Error Criterion (FPE), The Akaike Information Criterion (AIC), The Schwarz Bayesian Information Criterion (SBIC) and the Hannan – Quinn Information Criterion (HQC). There is no unanimous agreement on which criterion to use in case of conflicting results among the above methods. The decision criteria are to select a model with the lowest value of information criteria. In this case, lag selection information criteria are shown in the table 10.

Table 10: Lag Selection

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-370.23				367275	21.3275	21.3735	21.4608
1	-352.9	34.66	9	0	228849	20.8514	21.0355	21.3847
2	-333.028	39.744	9	0	124610*	20.2302*	20.5523*	21.1634*
3	-327.183	11.691	9	0.231	154181	20.4104	20.8706	21.7436
4	-318.293	17.779*	9	0.038	165218	20.4167	21.015	22.1499
5	-311.611	13.365	9	0.147	210000	20.5492	21.2855	22.6822

From the results above, the lowest FPE, AIC, HQIC and SBIC is at lag 2 but lowest LR is at lag 4. In the event of conflict in lag length selection, the appropriate way is to plot the correlogram of residuals and select the lag length as one where the correlograms are statistically insignificant. The correlogram of the residuals was presented in figure 8 as shown below;

Figure 8: Correlogram of the residuals



From the correlogram of residuals the study identified an optimal lag length of 1 since the correlograms were statistically insignificant.

4.7 Cointegration Test

Johansen Cointegration test was used here so as to determine if there was a cointegrating vector among the variables. This was to help determine whether there was long term relationship

existing for the variables. When the series is cointegrated, it is necessary to investigate causality, using error correction model; otherwise, the VEC model will be reduced to basic VAR. The results from Johansen Cointegration test were as shown in table 11 below;

Table 11: Johansen Tests for Cointegration

Maximum rank	**Parms**	**LL**	**Eingen value**	**trace statistics**	**5%critical value**
0	12	-408.268		37.2037	29.68
1	17	-398.96	0.37955	18.5889	15.41
2	20	-391.306	0.32465	3.2801*	3.76
3	21	-389.666	0.08067		
Maximum rank	**Parms**	**LL**	**Eingen value**	**trace statistics**	**5%critical value**
0	12	-408.268		18.6149	20.97
1	17	-398.96	0.37955	15.3087	14.07
2	20	-391.306	0.32465	3.2801	3.76
3	21	-389.666	0.08067		

In determining whether the variables are cointegrated, at 0, when the trace statistic is more than 5% critical value, the study rejects the null hypothesis since this means that there is no co-integration (Zero co-integration). At one when the trace statistic is more than 5% critical value, the study rejects null hypothesis since there is co-integration. At two when the trace statistic is less than 5% critical value, the study rejects null hypothesis since there is co-integration, and at three, when trace statistic is more than 5% critical value, reject the null hypothesis since there is Cointegration.

In the four cases, the study rejects null hypothesis in all the case except the null that there is Cointegration in the Johansen test. Thus the three variables were cointegrated and they had a long term relationship implying that they were moving together in the long run. When variables

are cointegrated, Vector Error Correction Model, (VEC Model) is fitted, otherwise Vector Auto Regression Model, (VAR Model) is fitted.

To further confirm that VAR model was not suitable for this analysis, the study tested the stability and autocorrelation of the residuals using Eingen stability condition. The results were as shown in table 12 below;

Table 12: Eingen value Stability Condition

Eigen value	Modulus
0.798781	0.798781
0.602423	0.602423
0.075171	0.075171

From the results, all the eingen values are within the unit circle. The VAR therefore, satisfies the condition of stability. Further, the study ran the lagrange - multiplier test to test for the joint null for the three equations. The null hypothesis was that there was no autocorrelation at lag order. This yielded the following results in table 13;

Table 13: Lagrange - multiplier test

lag	chi2	Df	prob> chi2
1	11.8468	9	0.22208
2	18.0695	9	0.03438
3	18.9083	9	0.02598
4	3.3462	9	0.94898

From the results the study rejected the null for no residual autocorrelation at order (lag) 1 at 5% significance level hence no evidence which could be used to contradict the validity of the VAR model. Since there is already a stationary data, the next step was to determine granger causality.

4.7 Granger Causality Test

To determine if GDP, Inflation and Debt affect one another over time, the study performed granger causality test. This test was used to investigate any direct influence between the variables. Variables are said to granger cause other variables, when given their past values, the past values of the other variables are useful in predicting them. In each variable, the study tested the null hypothesis that the depended variables do not granger cause other variables. The results of the test were as presented in table 14;

Table 14: Granger causality tests

Equation	Excluded	chi2	Df	prob>chi2
GDP	Debt	0.33002	1	0.566
GDP	Inflation	0.69552	1	0.404
GDP	ALL	1.6504	2	0.438
Debt	GDP	3.295	1	0.069
Debt	Inflation	4.8854	1	0.027
Debt	ALL	6.7036	2	0.035
Inflation	GDP	2.1892	1	0.139
Inflation	Debt	2.3821	1	0.123
Inflation	ALL	3.622	2	0.163

For granger causality test, if P> 0.05, null hypothesis is rejected. From the results above, only the lagged variable inflation helps predict debt variable since the p-value is 0.027. Both inflation and GDP variables jointly help in predicting debt (p value of 0.035). In all the other equations there is no evidence of granger causality since they have large p – values at 5%.

4.8 VEC Model

Having established that the variables are cointegrated, a VEC model was estimated and the results presented in appendix 1. The coefficient -0.1125098 represent error correction term. It indicates the speed of adjustments towards long term equilibrium. In this case it was not significant since it has a large p-value. This meant that there was no long term causality coming from GDP and Inflation to debt. The constants just below the coefficients are short run coefficients of the model.

Neither the GDP lag 1 coefficient, 0.01112587, is significant, nor even lags 2,3 and 4, in explaining the dependent variable, GDP. This also applies for the coefficients of inflation and debt since the study observed that these variables and even their given lags do not help in explaining GDP in the short run.

4.9 Post Estimation Analysis

The study then performed post estimation analysis of the model to help determine its effectiveness in modeling the impact of external debt and Inflation on GDP. The results of the analysis are as shown below;

(1) [D_GDP] LD.debt	= 0
(2) [D_GDP]L2D.debt	= 0
(3) [D_GDP]L3D.debt	= 0
(4) [D_GDP]L4D.debt	= 0
(5) [D_GDP]LD. inflation	= 0
(6) [D_GDP]L2D.inflation	= 0
(7) [D_GDP]L3D.inflation	= 0
(8) [D_GDP]L4D.inflation	= 0

Chi2 (8) = 2.94

Prob > chi2 = 0.9379

The above equations are null that LD.debt, L2D.debt, L3D.debt, L4D.debt, LD. inflation, L2D.inflation, L3D.inflation and LD4.infaltion are jointly zero in explaining GDP. Chi2 value is 2.94 and the p – value of 0.9379 is very large meaning the study could not reject the null implying that there was no (zero) short term causality running from inflation, debt to GDP. Thus Inflation and debt cannot cause GDP.

4.10 Autocorrelation Tests

Lag ranger multiplier test was used to check for serial autocorrelation. To check for serial autocorrelation, lag ranger multiplier test for residual autocorrelation was determined and the results were as shown in table 15 below;

Table 15: Lag ranger multiplier diagnostic test

Lag	**chi2**	**Df**	**prob > chi2**
1	7.3832	9	0.59729
2	3.8114	9	0.92338
HO: No autocorrelation at lag order;			

From the results, the p – values are very large meaning that the study could not reject the null of no autocorrelation. This meant that there was no autocorrelation hence null hypothesis was true. The study therefore accepted the results of the model.

4.11: Impulse Response Functions

The impulse response analysis traces the effect created by on standard deviation shock to the innovation on current and future values of all the endogenious variables in the system. The impulse response and the plots that follow indicate a summary of the results of the shock evaluation over eight year time period to an initial one standard deviation positive shock to each of the variables in VEC model

Figure 9: Impact of shock on debt, gdp and inflation

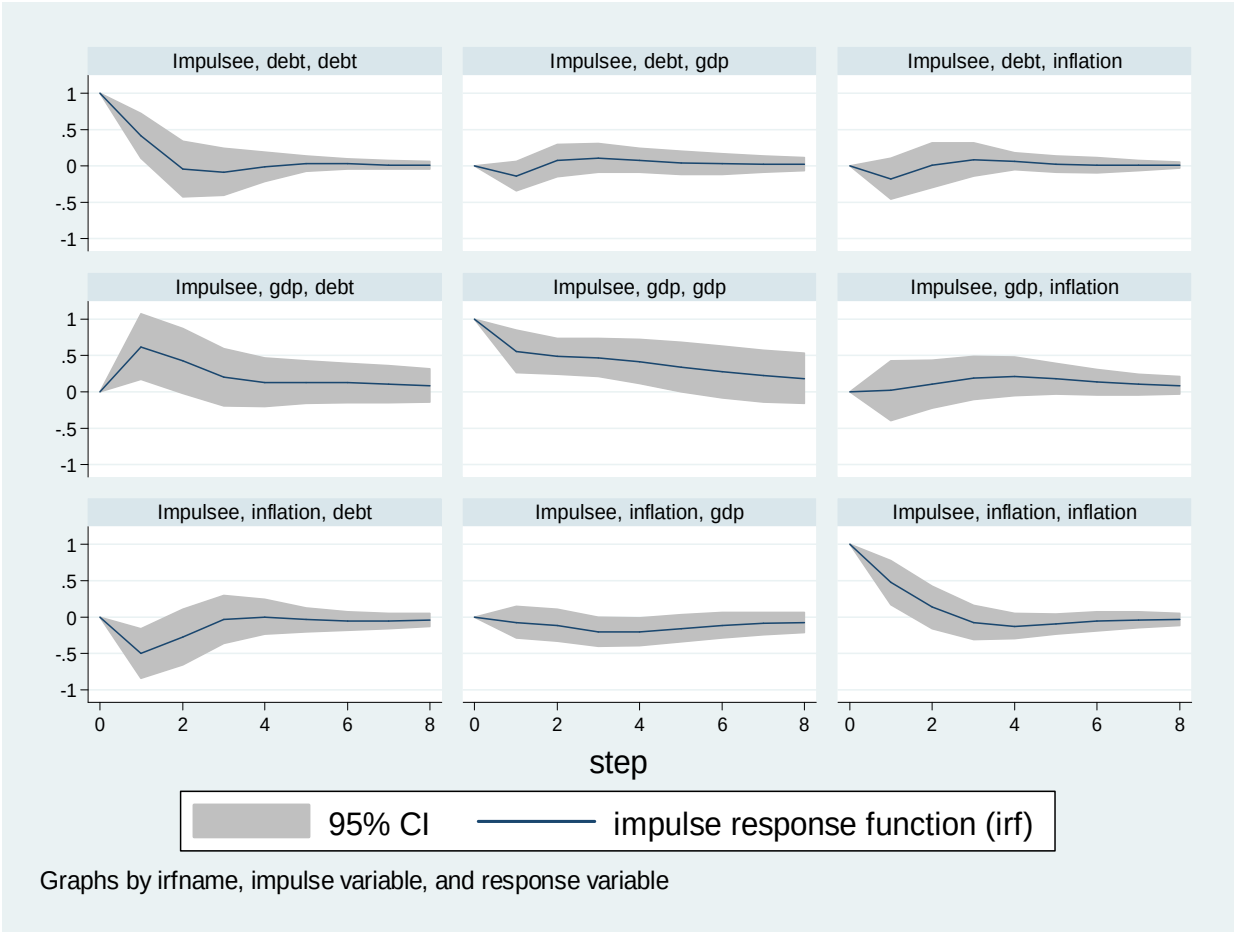


Figure nine above shows the impact of one standard deviation shock on debt, gdp and inflation. One standard deviation shock on debt results in a deviation of debt with negative slope up to year two before leveling off, a negative deviation on gdp up to year one then rises up to year two before finally leveling off and a negative deviation on inflation up to year one then rises up to year two before finally leveling off. A shock on gdp results into a steep increase on debt up to year one before a steady decrease up to year three then leveling off, a negative steep slope on gdp for the first one year before a steady slight decrease and a slight increase in inflation up to year before leveling off. Finally, a shock on inflation results in negative steep slope on debt for

the first one year before increasing steadily up to year three then leveling off, a slight decrease in inflation up to year four and a slope to the negative up to year four before leveling off.

These results are consistent with the cointegration test which established long run relationship among the variables. A shock on debt, gdp and inflation is felt immediately and creates an impact on the economy in long run.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter contains the conclusions from the findings of the study and the recommendations on the areas for further research.

5.2 Conclusion

The study was motivated by the believe that external debt levels and inflation may affect economic growth. In this case the main objective of the study was to determine the effect of external debt and inflation on economic growth in Kenya. To achieve this objective, annual time series information for the variables was obtained from 1970 to 2010. The data were tested for Stationarity and analyzed by help of inferential statistics. The specific objectives for the study were to determine the effects of external borrowings on economic growth in Kenya, to examine the effect of inflation on economic growth in Kenya and to establish whether external debt and inflation cause economic growth in Kenya. The study used VEC model for the analysis. The justification for VEC is that the data was time series and the variables were found to be cointegrated hence compromising the use of VAR model for the analysis (Sichei 2002).

To establish the long term and short term relationship, the study used Johansen Cointegration test and Granger causality test was used to determine the cause and effect among the three variables. A VEC model with one lag was estimated. The results indicated that there was no long term causality running from external debt and inflation to GDP. The variables and their lags were also noted to be non significant in explaining short term causality and the effect of external debt and

inflation to GDP. This is in agreement with Cohen (1997) on the correlation between developing countries debt and investment. The research showed that the level of stock of debt does not appear to have much power to explain slow down of investments in developing countries. Cohen, established that it is the actual flow of net transfers that matter hence the actual service of debt 'crowded' out investment.

The second objective aimed at analyzing the effect of inflation on economic growth. Despite the findings from the study that inflation was insignificant in explaining GDP both in long run and short run in Kenya, some studies have pointed out to a chilling effect of uncertainty over predictability of inflation on long run. For instance, Aarstol (2000) found a negative relationship between inflation and the level of private debts used for investment aimed at spurring economic growth. This resulted into providers of funds (external debt) and the market in general providing funds in short term rather than in long run implying that the resulting effect could be increased growth over a short time span when the funds are available. This may however not be the case since inflation variable and its lagged variables do not significantly explain the GDP or the lagged GDP variable.

The third objective was to establish whether external debt variable and inflation variable can cause GDP. The study found both the variables and their lagged variables to be statistically insignificant in explaining the cause on GDP and the GDP variables. This was the case for both the short run and long run terms. Therefore external debt and inflation cannot cause GDP in Kenya

5.3 Recommendation

This research study investigated the effect of external public debt and inflation on GDP in Kenya from 1970 to 2010. At start the study applied the unit root test to establish Stationarity of the series data. The result indicates that the data was not stationary and that they are integrated to order one. The study then applied the Johansen Cointegration test so as to establish the long run relationship among the three variables. Results from Cointegration test showed a cointegrating relationship among the variables indicating long term co-movement of the variables. The study also sort to determine if the variables and their lagged values granger cause each other or other variables using granger causality test. In the findings, the study noted that the variables and their lagged values do not granger cause other variables in consideration.

From the findings, the study disagrees with the expectation that external debt levels and the levels of inflation affecting the economy cause or impact on the level of Kenya's economic growth. Therefore there is no chance of these two variables affecting economic growth levels in Kenya.

However, the Kenyan government needs to pay attention to other research studies which have indicated a possible negative impact of external public debt to economic growth including debt servicing. Inflation is also fronted in some studies as possibly creating negative effect in the economy due to increase in the price levels

To increase economic development using external debt, the government needs to use the policies available on both external debt level and usage to spur economic growth and to avoid possible negative effect from excessive debt servicing. Suggested areas for further study are

macroeconomic areas such as the domestic debt and economic growth both in long run and short run.

REFERENCES

Aarstol, M. (2000). “Inflation, Agency Costs, and Equity Returns”. *Journal of Economic Literature*, 52:387–403

Abbass, S.M & Christensen, E. (2007). *The Role of Domestic Debt Markets in Economic Growth*: An Empirical Investigation for Low-income Countries and Emerging Markets International Monetary Fund WP/07/127IMF Working Paper

Ajayi, S.I. & Iyoha M.A. (1998). *Debt overhang and debt forgiveness*: The case of the severely-indebted low income countries of Sub-Saharan Africa. J. Econ. Manage., 5(1), January.

Amassoma, J. and Barr (2011). “External Debt, Internal Debt and Economic Growth Bound in Nigeria Using A Causality Approach”. *Journal of Current Research Journal of Social Science* volume: 3 issue: 4 pp. 320-325.

Catherine P, Hélène P and Luca R. (2011). “External Debt and Growth”. *Journal of Review of Economics and Institutions* issn: 20381379 volume: 2 issue: 3 provider: doaj doi: 10.5202/rei.v2i3.45

Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya], and ORC Macro. 2004. *Kenya Demographic and Health Survey 2003*. Calverton, Maryland: CBS, MOH, and ORC Macro.

Checherita, W. (2012). *Debt and Growth new Evidence for the Euro Area*. European Central Bank, Working paper series No. 1450/July 2012

Cohen, D. (1997). Growth and external debt: A new perspective on the African and latin american tragedies. Centre for Economic Policy Research Discussion Paper, No. 1753.

Crepon, B. (1998), Research, Innovation, and Productivity: An Econometric Analysis at the Firm Level, NBER Working paper series 6696 available online at http://www.nber.org/w6696

Ding M, Chen Y, & Bressler S. (2006),”Granger causality: basic theory and application to neuroscience”. Handbook of time series analysis. Berlin: Wiley-VCH Verlag;. p. 437–60.

Ejermo, O. (2006). *Technology and Trade - an analysis of technology specialization and export flow*s, CESIS, Electronic Working Paper Series, 2006, available online at http://www.infra.kth.se/cesis/documents/WP65.pdf

Elbadawi, I. & Ndulu B. (1996). *"Long-Term Development and Sustainable Growth in Sub Saharan Africa,"* in M. Lundahl and B. Ndulu (editors). New Directions in Development Economics: Growth, Environmental Concerns and Governance in the 1990s. Routledge.

Gandolfi, A.E. (1982), 'Inflation, Taxation and Interest Rates', *Journal of Finance* **37**, 797–807

Hawkins, J. D, Catalano, R. F., & Miller J.Y. (1992). *Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood*: Implications for substance abuse prevention. *Psychological Bulletin* 112 (1): 64-105.

Isaya, N, Owino, O, & Mutai N. (2008). *"Domestic Debt and its Impact on the Economy" – The Case of Kenya.* 13th *Annual African Econometric Society Conference*; Preteria

Johansen S. & Juselies, K. 1990. Maximum Likelihood Estimation and Inferences on Co-integration. *Oxford Bulletin of Economics and Statistics*, 52: 169-210.

Jones, C. I. (1995a) "Time Series Tests of Endogenous Growth Models," *Quarterly Journal of Economics* 110, May, pp. 495-525.

Jones, C. I. (1995b) "R&D-Based Models of Economic Growth," *Journal of Political Economy* 103, August, pp. 759-784.

Kenya, Government. 2000. *Kenya Institute for Public Policy Research and Analysis*. KIPPRA Discussion Paper No. 3. Nairobi: Institute of Policy Analysis and Research

Kenya, Government. 2005/06: Annual Public Debt Report. Nairobi: Government Pinter

Krugman, P. (1988): "International debt strategies in an uncertain world" in Cuddington, J. and Smith, G., eds., International debt and the developing countries, World Bank.

Leijonhufvud, A. (1977). "Costs and consequences of inflation". Oxford University Press

Lensink, R. & Howard W. (1999) "Is there an aid Laffer curve?", mimeo.

Masson, P. (1998), .Contagion: Monsoonal Effects, Spillovers, and Jumps between Multiple Equilibria., IMF Working Paper No.142.

Mbanga, G. & Sikod F. (2001),"The Impact of Debt and Debt-Service Payments on Investment In Cameroon", Final Report submitted to AERC, Nairobi, May

Ministry of finance, June 2006, "Annual Public Debt Management Report". Second annual debt management report

Ministry of Finance, June 2007, "Annual Public Debt Management Report". Second Annual Debt Management Report. Nairobi: Government Printer

Njuguna, N, Kamau, T & Owino, O. (2008). Unlocking the Future Potential for Kenya: The Vision 2030 Preliminary Draft Chapter 4. Nairobi: Government Printer

Oke M.O (2012). Insurance Sector Development and Economic Growth in Nigeria. African J. Business Management. 6(23): 7016-7023.

Persson, T. & Tabellini, G. (2001). “Political Institutions and Policy Outcomes: What are the Stylized Facts?” Mimeo.

Ramsey F.P. (1928), "A Mathematical Theory of Saving," *Economic Journal*, Vol. 38, No 152, pp. 543 559

Reinhart, M, C, Carmen M., & Kenneth, S. R. **(**2010). *This Time Is Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press.

Riman, H.B.; Esso, I.E. & Eyo, E.(2008). Stock Market Performance and Economic Growth in Nigeria: A Causality Investigation. *Global Journal of Social Sciences, 7(2):88-91*

Romer, P. M. (1990), ‘Endogenous technological change’, *Journal of Political Economy*, 98, 71-102.

Sachs, J. (1989): "The debt overhang problem of developing countries”, presented at the conference in memorial to Carlos Diaz—Alejandro, Helsinki, August 1986.

Schclarek, A. (2004), *Debt and Economic Growth in Developing Industrial Countries*, mimeo, available on-line in http://www.nek.lu.se/publications/workpap/Papers/WP05_34.pdf

Sims, C.A. 1980. Macroeconomics and Reality. Econometrica 48, 1-48.

Solow, M, R. (1956), "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, 70(1), p 65-94.

Tanzi, V. & Schuknecht, L. (1997). “Reconsidering the Fiscal Role of Government: The International Perspective,” *American Economic Review*, 87 (2), 164-168.

Appendix 1:

Figure 1: Debt Descriptive Statistics

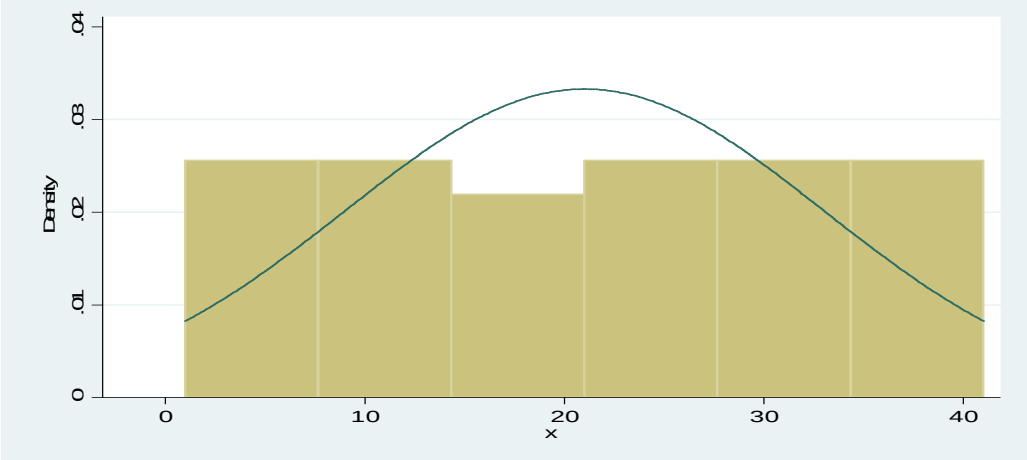


Figure 2: Inflation Descriptive Statistics

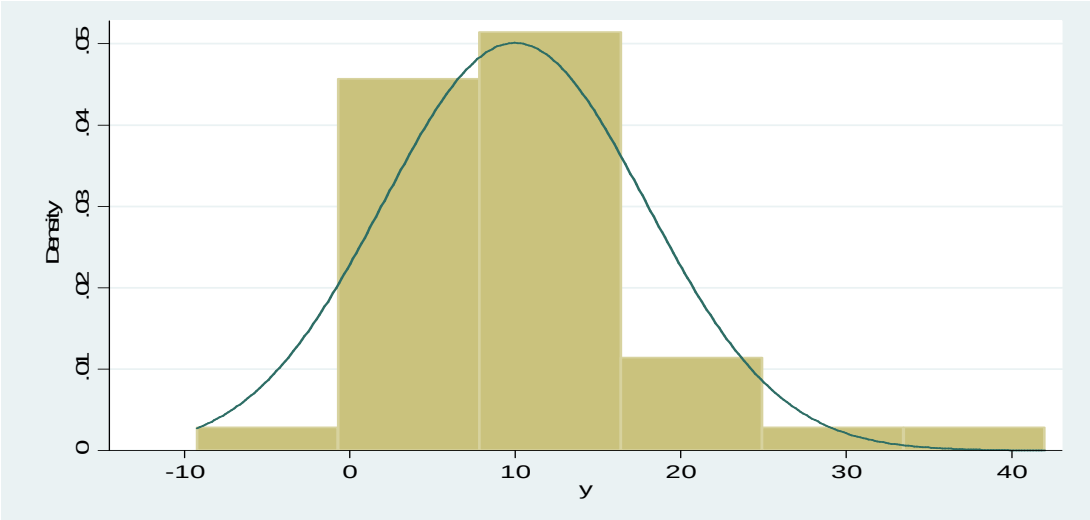


Figure 3: GDP Descriptive Statistics

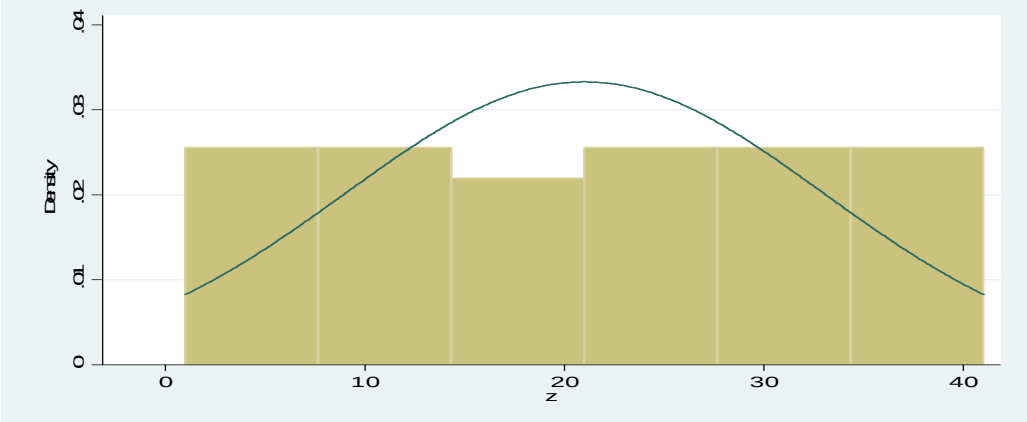


Figure 5: Debt Time series Plot

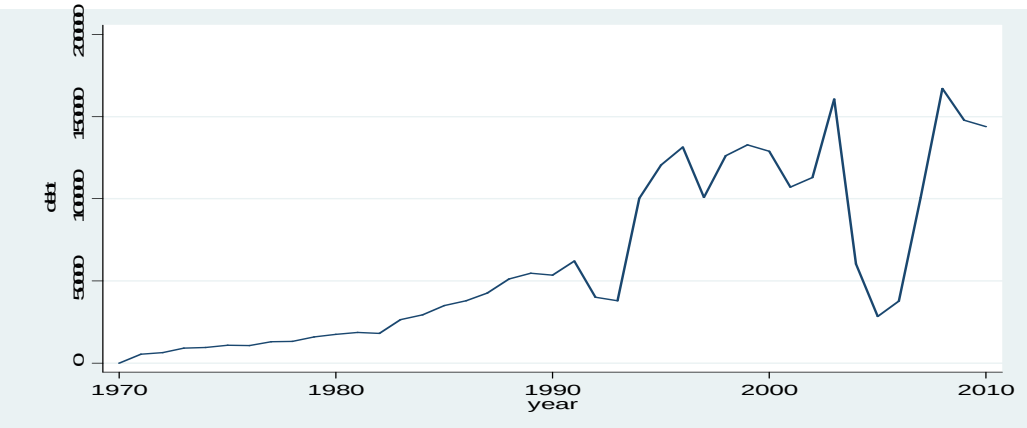


Figure 6: Inflation Time Series Plot

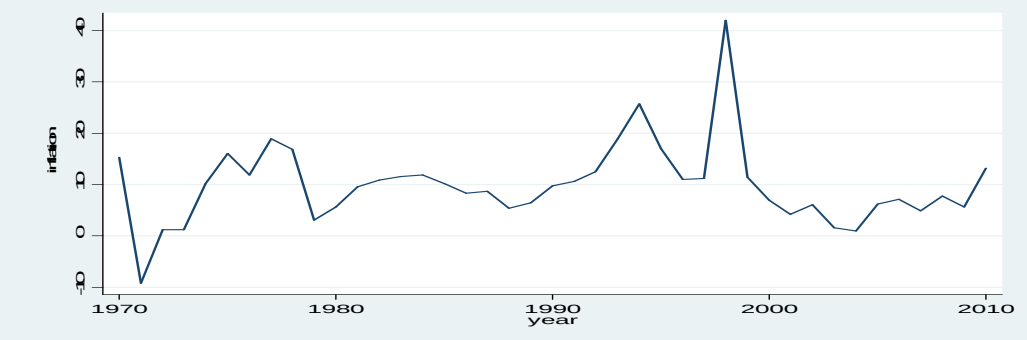


Figure 7: GDP Time series Plot

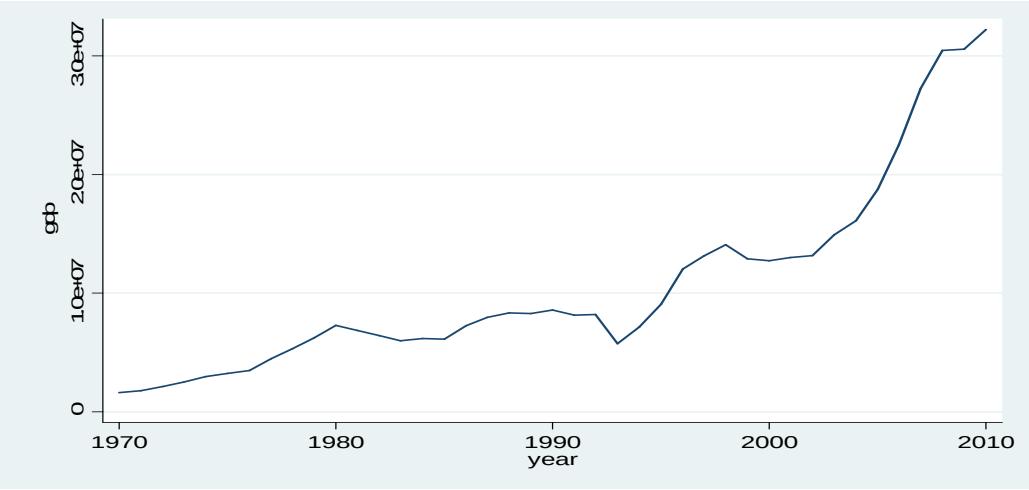


Table 7: First Difference Stationarity Check Trend

	Test Statistic	**1% critical Value**	**5% Critical Value**	**10% Critical Value**		
Z(t)	-7.62	-3.655	-2.961	-2.613		
GDP	Coef	Std. Err	T	P > | t |	[95% Conf.	Interval]
	-1.221523	0.160315	-7.62	0	-1.54635	-0.896695
_cons	0.6264223	1.178066	0.53	0.598	-1.76057	3.013411

Table 8: First Difference Stationarity Check Trend and Intercept

	Test Statistic	**1% critical Value**	**5% Critical Value**	**10% Critical Value**		
Z(t)	-7.657	-4.251	-3.544	-3.206		
GDP	Coef	Std. Err	T	P > | t |	[95% Conf.	Interval]
	-1.239857	0.161926	-7.66	0	-1.56826	-0.911456
_trend	-0.0962961	0.105468	-0.91	0.367	-0.3102	0.1176036
_cons	2.561747	2.426331	1.06	0.298	-2.35908	7.482575

Table 9: First Difference Stationarity Check without Trend and Intercept

	Test Statistic	**1% critical Value**	**5% Critical Value**	**10% Critical Value**	
Z(t)	-7.674	-2.638	-1.95	-1.606	
GDP	Coef	Std. Err	T	P > | t |	[95% Conf. Interval]
	-1.215575	0.158407	-7.67	0	-1.53625 -0.894896

VEC Model Results

	Sample: 1975-2010				No. of obs	= 36	
	Log likelihood = -322.2485				AIC	= 20.34714	
	Det (Sigma_kl) = 11956.89				HQIC	= 21.02265	
					SBIC	= 22.28255	
	Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
	GDP	14	7.98414	0.2928	9.107611	0.8241	
	Debt	14	6.70236	0.7469	64.92918	0	
	Inflation	14	5.0451	0.7838	79.74925	0	
		Coef.	Std. Err.	Z	P >| z |	[95% Conf.	Interval]
	$L1.^{cel}$						
GDP	LD^{z}	-0.11251	0.242953	-0.46	0.643	-0.58869	0.363669
		-0.11126	0.284612	-0.39	0.696	-0.66909	0.446571
	L2D	0.015085	0.270281	0.06	0.955	-0.51466	0.544827
	L3D	0.487898	0.333669	1.46	0.144	-0.16608	1.141877
	L4D	-0.06501	0.470413	-0.14	0.89	-0.987	0.856983
	LD^{x}						
		-0.10234	0.205663	-0.5	0.619	-0.50543	0.300754
	L2D	0.069182	0.180277	0.38	0.701	-0.28415	0.422518
	L3D	0.037112	0.187884	0.2	0.843	-0.33113	0.405357
	L4D	0.075949	0.191141	0.4	0.691	-0.29868	0.450578
	LD^{y}						
		0.090085	0.650916	0.14	0.89	-1.18569	1.365858
	L2D	-0.16946	0.341573	-0.5	0.62	-0.28415	0.500013
	L3D	-0.14748	0.316537	-0.47	0.641	-0.76788	0.472925
	L4D	0.000151	0.205822	0	0.999	-0.40325	0.403556
	_cons	0.168931	1.375433	0.12	0.902	-2.52687	2.86473
	$L1.^{cel}$						
Debt	LD^{z}	1.028198	0.203949	5.04	0	0.628465	1.427931
		-0.37138	0.23892	-1.55	0.12	-0.83966	0.096893
	L2D	-0.67388	0.22689	-2.97	0.003	-1.11858	-0.22919
	L3D	-1.61396	0.280102	-5.76	0	-2.16295	-1.06497
	L4D	-1.17951	0.394893	-2.99	0.003	-1.95349	-0.40554

	LD^{x}						
		0.148705	0.172646	0.86	0.389	-0.18967	0.487084
	L2D	0.349152	0.151335	2.31	0.021	0.052541	0.645763
	L3D	-0.04343	0.157721	-0.28	0.783	-0.35255	0.265699
	L4D	-0.36558	0.160455	-2.28	0.23	-0.68006	-0.05109
	LD^{y}						
		1.647204	0.546418	3.01	0.003	0.576245	2.718163
	L2D	0.611769	0.286737	2.13	0.033	0.049775	1.173763
	L3D	0.480382	0.26572	1.81	0.071	-0.4042	1.001184
	L4D	0.097939	0.172779	0.57	0.571	-0.2407	0.43658
	_cons	0.017043	1.15462	0.01	0.988	-2.24597	2.280057
	$L1.^{cel}$						
Inflation	LD^{z}	-0.04552	0.15352	-0.3	0.767	-0.34642	0.255369
		-0.23005	0.179844	-1.28	0.201	-0.58254	0.122433
	L2D	-0.64939	0.170788	-3.8	0	-0.98412	-0.31465
	L3D	0.633242	0.210842	3	0.003	0.219999	1.046485
	L4D	0.67278	0.297249	2.26	0.024	0.091817	1.255378
	LD^{x}						
		0.152417	0.129956	1.17	0.241	-0.10229	0.407127
	L2D	-0.06797	0.113915	-0.6	0.551	-0.29124	0.155295
	L3D	-0.06	0.118722	-0.51	0.613	-0.29269	0.172687
	L4D	0.277354	0.12078	2.3	0.022	0.040629	0.514078
	LD^{y}						
		-0.51755	0.411308	-1.26	0.208	-1.3237	0.288595
	L2D	-0.01125	0.215837	-0.05	0.958	-0.43429	0.411778
	L3D	-0.15524	0.200017	-0.78	0.438	-0.54726	0.23679
	L4D	-0.0319	0.130057	-0.25	0.806	-0.28681	0.223006
	_cons	-0.03262	0.869123	-0.04	0.97	-1.73607	1.670831

Cointegrating equations

	Equation	parms	chi2	P>chi2		
	_cel	2	94.03674	0		
	beta	Coef.	Std. Err	Z	P>| z |	[95% Conf. Interval]
_cel						
	GDP	1	.	.	.	.
	Debt	-1.28193	0.168203	-7.62	0	-1.6116 -0.95226
	Inflation	-2.7864	0.414773	-6.72	0	-3.59934 -1.97346
	_cons	32.59632				

Basic Data

Year	External debt $ 000	Inflation GDP Deflator (annual %)	GDP (Current US $ 000
1970		15.32	1,603,447
1971	5,264	-9.22	1,778,391
1972	6,367	1.22	2,107,279
1973	9,170	1.21	2,502,142
1974	9,452	10.2	2,973,309
1975	10,824	16.05	3,259,345
1976	10,594	11.84	3,474,542
1977	12,947	18.91	4,494,379
1978	13,082	16.9	5,303,735
1979	15,832	3.08	6,234,391
1980	17,412	5.64	7,265,315
1981	18,591	9.55	6,854,492
1982	18,116	10.85	6,431,579
1983	26,303	11.59	5,979,198
1984	29,397	11.84	6,191,437
1985	34,947	10.19	6,135,034
1986	38,105	8.31	7,239,127
1987	42,680	8.71	7,970,821
1988	51,220	5.4	8,355,381
1989	54,684	6.46	8,283,114
1990	53,498	9.77	8,572,359
1991	62,056	10.64	8,151,489
1992	40,188	12.53	8,209,121
1993	37,905	18.9	5,751,786
1994	100,232	25.7	7,148,149
1995	120,447	17.02	9,046,320
1996	131,516	11.02	12,045,860
1997	100,910	11.22	13,115,760
1998	126,100	41.99	14,094,000
1999	132,773	11.44	12,896,010
2000	129,000	6.93	12,705,350

2001	106,968	4.19	12,985,990
2002	112,955	6.08	13,147,740
2003	160,589	1.57	14,904,500
2004	60,291	0.93	16,095,320
2005	28,474	6.2	18,737,900
2006	37,708	7.13	22,504,140
2007	100,614	4.9	27,236,740
2008	167,245	7.79	30,465,490
2009	147,868	5.61	30,580,370
2010	143,857	13.21	32,198,150

Transformed Data

Year	**ln(Debt)**	**ln(Inflation)**	**ln(GDP)**
1970	3.713572	2.729159	0
1971	3.465736		0.6931472
1972	3.583519	0.1988509	2.564949
1973	3.663562	0.1906204	2.639057
1974	3.688879	2.322388	2.70805
1975	0.6931472	2.775709	2.890372
1976	0	2.471484	2.944439
1977	2.079442	2.939691	3.135494
1978	2.484907	2.827314	3.178054
1979	2.833213	1.12493	3.367296
1980	2.995732	1.729884	3.526361
1981	3.091043	2.256541	3.433987
1982	3.044523	2.384165	3.401197
1983	3.135494	2.450143	3.258096
1984	3.218876	2.471484	3.332205
1985	3.258096	2.321407	3.295837
1986	3.367296	2.11746	3.496508
1987	3.433987	2.164472	3.555348
1988	3.496508	1.686399	3.663562
1989	3.555348	1.865629	3.637586
1990	3.526361	2.279316	3.688879

1991	3.637586	2.36462	3.583519
1992	3.401197	2.528126	3.610918
1993	3.332205	2.939162	3.218876
1994	1.098612	3.246491	3.465736
1995	2.197225	2.834389	3.713572
1996	2.564949	2.399712	1.098612
1997	1.609438	2.417698	1.94591
1998	2.302585	3.737432	2.197225
1999	2.639057	2.437116	1.609438
2000	2.397895	1.93586	1.386294
2001	1.791759	1.432701	1.791759
2002	1.94591	1.805005	2.079442
2003	2.890372	0.4510756	2.302585
2004	3.610918	-0.0725707	2.397895
2005	3.178054	1.824549	2.484907
2006	3.295837	1.964311	2.772589
2007	1.386294	1.589235	2.833213
2008	2.944439	2.052841	2.995732
2009	2.772589	1.724551	3.044523
2010	2.70805	2.580974	3.091043

Appendix II: Time Frame

ACTIVITY	JN-FEB	MAR-APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
IDENTIFYING PROBLEM AND TOPIC									
PROPOSAL WRITING									
PROPOSAL DEFENCE									
CORRECTION OF DEFENCE									
DATA COLLECTION									
DATA ANALYSIS									
DESSERTATION DEFENCE									
CORRECTION OF LAST COPY									
SUBMISSION TO S.O.B									

APPENDIX III: RESEARCH BUDGET

Items	**Ksh.**
Transport Cost	8,000
Printing	10,000
Internet Cost	4,500
Stationery	7,000
Communication cost	4,000
Other related costs	2,500
Total Costs	**36,000**