



**Strathmore**  
UNIVERSITY

**IMPACT OF PUBLIC DEBT ON ECONOMIC GROWTH  
Case Study - KENYA**

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## LIST OF ABBREVIATIONS

ACF	Autocorrelation Function
ADF	Augmented Dickey Fuller
CA Balance	Current Account Balance
CBK	Central Bank of Kenya
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
GNP	Gross National Product
M3	Broad Money
IMF	International Monetary Fund
KRA	Kenya Revenue Authority
KPSS	Kwiatkowski Phillips Schmidt-Shin
PACF	Partial Autocorrelation Function
OECD	Organization for Economic Cooperation and Development
SSA	Sub-Saharan Africa

## CHAPTER 1

### 1.0 INTRODUCTION

#### 1.1 Background

Public debt<sup>1</sup> is a major policy concern confronting governments globally, at moderate levels debt improves welfare and enhances growth however, it is detrimental to growth if not controlled. Therefore, high and rising debt witnessed particularly among developing countries should be a justifiable major concern.

According to Gill and Pinto (2005), sovereign debt enables governments of developing countries facilitate growth take-offs by investing in a critical mass of infrastructure projects and in social sectors when taxation capacity is limited, or when the alternative would be to print money therefore compromising macroeconomic stability. Debt also facilitates tax smoothing and counter-cyclical fiscal policies, which is essential for reducing output volatility; and permits equitable alignment of benefits and costs for long-term projects by shifting taxation away from current generations.

Theoretical and empirical research models point out the existence of a significant relationship between debt and growth. The simplest theoretical explanation was by Barro (1979), assuming taxes ultimately need to be raised to achieve debt sustainability, increased debt levels potentially leads to lower output and reduces government expenditure ultimately leading to a contraction of the economy. As for inflation, unanticipated high inflation reduces the real cost of servicing the debt. Since the effect of the inflation channel is sensitive to the maturity structure of debt, long-term debt is more vulnerable to inflation as compared to short-term debt. Therefore, any government that attempts to inflate away the real value of short-term debt will soon find itself paying much higher interest rates.

Reinhart and Rogoff (2012) significantly contributed empirically to the relationship after the global financial crisis by pointing out 90 per cent as the external debt to GDP threshold level and 60 per cent for total public debt. Above which economic growth declines by 0.1 per cent for advanced economies and an even greater 1 per cent decline for emerging economies using non-parametric methods for 44 advanced and emerging economies. However, a replication of the study by Herndon, Ash, and Pollin (2013), estimated a 2.2 per cent increase in economic

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<sup>1</sup> 'Public debt' refers to total gross central bank debt

growth on the same threshold after correcting for coding errors, inappropriate weighting of summary statistics as well as inclusion of available data therefore concluding that public debt has a positive effect on economic growth.

Furthermore, most empirical studies studying the relationship between public debt to economic growth have focused on the external debt as compared to domestic debt<sup>2</sup>. According to Abbas and Christensen (2007), there are three main reasons for this: data unavailability, domestic debt being regarded as endogenous rather than as an exogenous variable that the government can tweak to influence macroeconomic and lastly the relatively small size of domestic debt relative to external debt.

In as much empirical studies done have not focused on domestic debt, the role of government in creating an enabling environment in developing countries by controlling domestic debt is growing more tract. This is because of the key role the private sector plays in economic growth and development. According to Emran and Farazi (2008), as part of creating enabling environments the IMF and World Bank often include conditions that put a cap on government domestic debt to ensure it does not crowd out private investments.

Therefore, due to differences in structural and economic fundamentals it is important to study the effect of debt trajectories on economic growth for individual-countries instead of regional or economic blocs for both domestic and external debt. This study focused on the effect of public debt on economic growth in the short term and long term considering the various channels in which it affects growth mainly total factor productivity, capital stock and GDP growth in Kenya. Additionally, it examined the different forms of debt will giving more conclusive results on the implication of debt on the economy and provides informed public policy recommendations on the most ideal form of debt for the country.

### ***1.1.1 Public Debt in Kenya***

Kenya, like many other developing countries is dependent on debt to fill in its savings and foreign exchange gap postulated by Chenery and Strout (1966) two gap model. Further, it has been among Africa's to investment destinations and plans on retaining that status as it gears towards realizing its long-term development footprint Vision 2030. Therefore, the Kenyan government should be careful in the level of debt it accumulates since high debt to GDP ratios

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<sup>2</sup> Domestic public debt is government debt issued under domestic legal jurisdiction and it includes treasury bills, treasury bonds, government stocks, overdraft at central bank, advances from commercial banks, items in transit, securities discounted and tax reserve certificates.

tend to avert investors. Therefore, this paper focuses on whether Kenya's level of public debt has the possibility of jeopardizing its growth and development goals.

According to Central Bank of Kenya statistics, at the end of September 2016 public debt stood at KES.3.6Trillion up from KES.1.5Trillion in 2012, of which KES.1.7Trillion was external debt and KES.1.85Trillion was domestic debt. The rise in debt has been linked to heavy investment in infrastructure mainly, Standard gauge railway and LAPPSET<sup>3</sup> which is mainly funded by external debt<sup>4</sup> leaving domestic debt unexplained. Currently, 32 per cent of revenue collected is spent on servicing public debt (KRA Report 2017). Moreover, the National Treasury Budget Statement 2017/2018, estimated a budget of KES.2.627Trillion with a KRA revenue shortfall of KES.1.7Trillion up from KES.1.4Trillion in 2016/2017 budget. This implies a possible increase in taxes or debt to cater for the deficit.

In late 2009, Greece experienced a sovereign debt crisis over the past decade because of profligacy of the government, weak revenue collection, and structural rigidities in Greece's economy which led to heavy borrowing in international capital markets to fund government budget and current account deficits (Nelson, Belkin, and Mix, 2010). Kenya suffers similar structural and policy issues amid rising public debt levels more specifically unwarranted public expenditures, corruption, high tax non-compliance rates and serve effects from global financial crises (Nyandemo, 2017).

Additionally, rising public debt should be a greater concern for emerging economies since they have a much greater future risk amid high population growth rates experienced leading to severe implications on GDP per capita (Reinhart and Rogoff, 2012). Therefore, high and rising public debt in Kenya should be a big concern for market players and the government.

The shift in the composition of overall public debt in favour of domestic debt in Sub-Saharan African countries has brought forward the need for governments to formulate and implement prudent domestic debt management strategies to mitigate the effects of the rising debt levels, (Putunoi and Mutuku, 2013). In Kenya, specifically, domestic debt has also risen throughout the years, most significantly between 2011 and 2016 from 20.06 per cent to 30.46 per cent of GDP<sup>5</sup>.

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<sup>3</sup> Lamu Port Southern Sudan Ethiopia Transit

<sup>4</sup> Total gross external debt includes external debts of all branches of government and includes public and publicly guaranteed foreign currency loans.

<sup>5</sup> Central Bank of Kenya Statistics

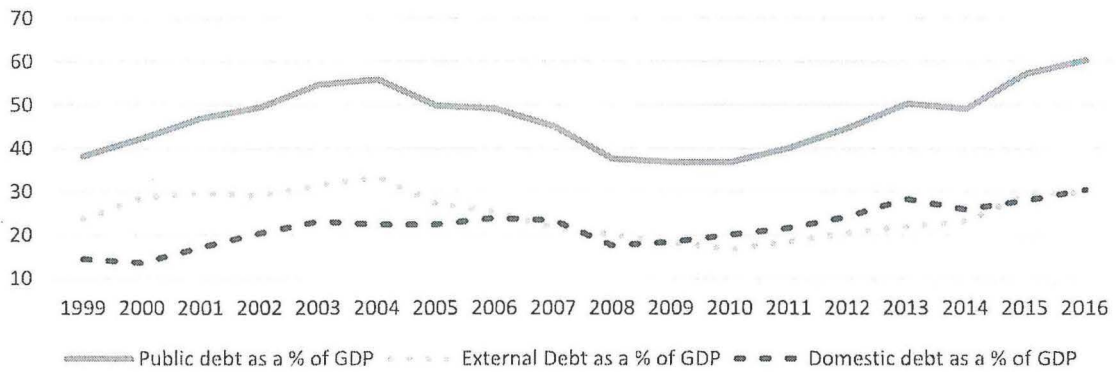


Figure 1.1 Public Debt as a % of GDP

Source: Central Bank of Kenya Statistics

Excessive domestic borrowing in a low savings country like Kenya relative to the other countries can increase the cost of borrowing hence potentially crowding out private sector investment. In addition, as a result of the Banking Amendment Act introduced in August 2016, bringing about an interest rate cap and floor, will potentially make banks favour treasury bills and bonds to loaning to the private sector, which might see a further increase in domestic debt.

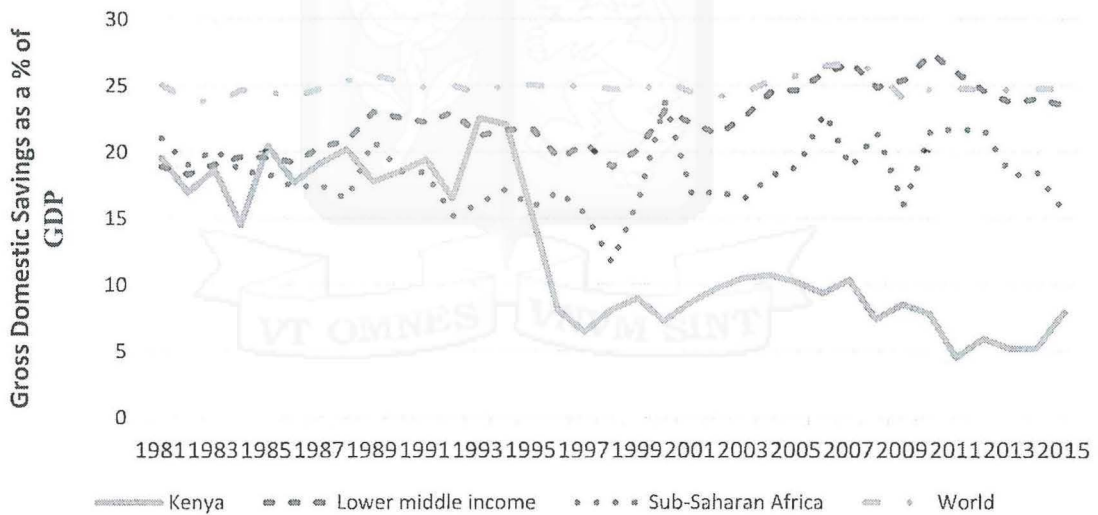


Figure 2 Gross Domestic Savings as a % of GDP

Source: World Bank national accounts data and OECD National accounts data files

Decreased government revenue and taxes for development expenditure because of devolution that led to a significant increase in recurrent expenditure will potentially cause a further increase public debt required for development expenditure. In essence devolution doubled the national wage bill without creating a significant revenue flow (Njenga, 2014). Nevertheless, this study will assume all public debt is only invested development expenditure, which is

consistent with the Public Finance Management Act (2012), “National government’s borrowing shall only be used for the purpose of financing development expenditure and not for recurrent expenditure.”<sup>6</sup>

## **1.2 Problem Statement**

Kenya’s debt sustainability has puzzled market participants in the light of an exponential increase of public debt levels in the recent past. The government has been experiencing high government spending and low government revenues. In addition, Kenya has significant structural weaknesses, weak revenue collection with high government spending and rapidly increasing public debt, which validates concerns on the sustainability of the current levels of debt.

Therefore, determining extensively sustainability of the current level of public debt level furthermore provide threshold levels for sustainable public debt to GDP ratios which, will guide future policy decisions, is key. Proper understanding of the relationship between public debt and economic growth is crucial for policy makers in the short run and in the long run as well as the implication of both external and domestic debt on economic growth. Assumptions based on theoretical frameworks and empirical frameworks analyses done in different countries or as regional or economic blocs can be misleading due to difference in economic and structural fundamentals.

Prior studies focus on the effect of external debt on economic growth leaving domestic debt mildly explored. It is important to understand the implications of the two forms of debt on economic growth especially with the recent shift of the composition of public debt in favour of domestic debt. Thus, guiding policy makers to the most effective source of funding with the lowest opportunity costs as a result maximize the desired outcomes of borrowing. This will also aid market participants such as foreign investors in correct risk profiling of their investments in the country.

## **1.5 Significance of the Research**

There is an urgent need for policymakers in governments, central banks, and international policy organizations to understand the effects of public debt on economic growth extensively.

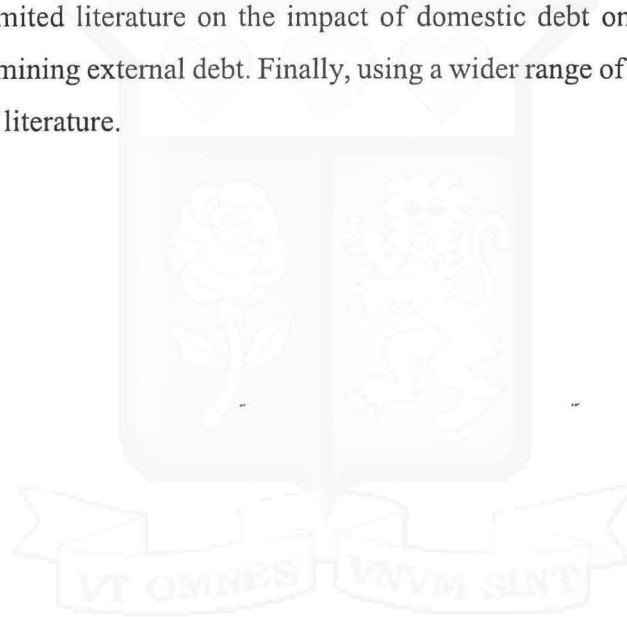
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<sup>6</sup> The Public Finance Management Act. (2012). Nairobi: National Treasury.

The government should further understand the appropriate mix of domestic and external debt as well as be informed of the level to which they can borrow without negatively affecting economic growth both directly and indirectly.

Secondly, the fear of investors interpreting high public debt-to-GDP ratios as the result of time inconsistencies or inflationary policies should lead governments to implement immediate and severe austerity measures on and adopt fiscal measures as well as alternatives to ensure public debt sustainability. Additionally, high burden in debt servicing affects investments as it potentially crowds out private investments

Lastly, studying a specific country enables the study considers country specific fundamentals hence more conclusive results as compared to regional analysis. Similarly, the study aims to fill the gap of limited literature on the impact of domestic debt on economic growth while concurrently examining external debt. Finally, using a wider range of data will enable the study build on existing literature.



## CHAPTER 2

### 2.0 LITERATURE REVIEW

#### 2.1 Theoretical Literature

Theoretical literature studying the relationship between public debt and economic growth can be dated as far back as in the 20<sup>th</sup> Century. It is mainly studied under three main schools of thought: Keynesian, Neoclassical and the Ricardian equivalence proposition. However, each school has varying propositions on the relationship and have been developed further over time.

##### 2.1.1 Keynesian Proposition

Keynesian economists argue increased public debt stemming from a budget deficit caused by increased government spending in a bid to curb recession has a positive effect on economic growth. That is because increased government jobs potentially leading to increased consumption stimulates the economy out of a recession. Building on the theory, Haavelmo (1945) and Peston and Baumol (1955), argued that an expansive fiscal policy resulting in budget deficit and public debt increases aggregate demand through a budget multiplier mechanism and through infrastructural development increases aggregate supply. The combined effect drives economic growth.

##### 2.1.2 Neo-classical Proposition

In contrast with the Keynesian view, neoclassical economists, from which majority theoretical models on public debt and economic growth are based, point towards a negative relationship. According to Meade (1958), government debt in excess of physical capital<sup>7</sup> is a burden to the economy. However, he fails to show whether the increase in savings as a result of a capital levy<sup>8</sup> is permanent or purely transitory as well as asserting the bearer of the burden of debt reduction and only focused on domestic debt.

Modigliani (1961) refined Meade's (1958) contribution and concluded that public debt is a burden for next generations. An increase in government spending boost the economy in the short run however, it places a gross burden to future generations through a reduction in aggregate stock of private capital. Additionally, it causes reduced private demand thereby

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<sup>7</sup> Dead-weight – government debt in excess of government owned physical capital

<sup>8</sup> Capital levy – tax on capital rather than income and is collected once rather than annually

depressing the presence of full employment. However, he explored the effects of the existences of government debt in an aggregate growth model.

Therefore, Diamond (1965), added the effect of taxes on capital stock and differentiates between external and domestic debt. He concluded that external debt reduces available lifetime consumption of the taxpayer as well as reduces disposable income thus reduces savings consequently reducing capital stock. Domestic debt has a greater effect on growth in addition to the effects of external debt has on economic growth he adds that it causes a further reduction in capital stock arising from substitution of government debt for physical capital in individual portfolios.

Gilles (1992) analysed the impact of fiscal policy on the level of public debt in an endogenous growth model framework and asserts that an increase in public debt reduces the growth rate therefore future generations will be affected. Therefore, in as much as reduction in public debt increases the growth rate it cannot be Pareto-improving since at least one current generation must be affected negatively.

### **2.1.3 Ricardian Equivalence Proposition**

The Ricardian equivalence proposition by Barro R. J. (1989), contrasts both Keynesian and Neo-classical view. It proposes that public debt has no impact on economic growth assuming market players are rational and forward looking. He argues that market players will reduce consumption when there is a fiscal stimulus anticipating a future increase in taxes therefore neutralizing the impact of the demand stimulating fiscal policy. However, Smetters (1999), critiques the paper on five main fronts; imperfect inheritability of time preference parameters, myopia among market players, borrowing constraints, distortionary labour taxation and strategic bequest motives.

## **2.2 Empirical Literature**

### **2.2.1 Public Debt and Economic Growth**

Fischer (1993), studied the relationship between macroeconomic factors and economic growth mainly budget deficits and inflation. The study extended and strengthened results presented in (Fisher, 1991) by further using an analogy of growth accounting<sup>9</sup> model that enabled him to identify the specific channels through which macroeconomic factors affects growth. Using a

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<sup>9</sup> Growth accounting decomposes output growth into the contribution of changes in factor inputs capital and human capital accumulation and a residual, TFP (Pattilo, Poirson, and Ricci, 2004).

sample dataset of 101 countries for the period 1960-1989, he presented cross-sectional and panel regressions he established a strong positive correlation between a budget surplus and growth. An increase in budget deficit of 1 per cent of GDP would reduce the growth rate of capital by 0.08 percentage points while it could cause an even greater decrease of 0.38 percentage points on the growth rate of productivity. Additionally, assuming a capital output ratio<sup>10</sup> of 2.5 the investment share of GNP would decline by 0.2 percentage points implying a relatively low level of crowding out. No significant relationship between labour force growth and budget deficits was established. Furthermore, he recommended more detailed studies of individual countries based on structural models in order to define a stable and sustainable macroeconomic framework of the channels through which macroeconomic variables affect growth.

Elbadawi, Ndulu, and Ndung'u (1997), studied the effect of debt on growth using a quadratic specification while controlling for country effects on 99 developing countries. The growth model was specified to capture the channels through which indebtedness is working against growth in per capita income. Four main channels were established, the first two give rise to the Laffer curve<sup>11</sup>, which shows that there is a limit to debt accumulation, which was established at 97 per cent of GDP. The two channels are current debt that stimulates growth and past debt that causes a debt overhang<sup>12</sup>, combined and the third channel is through a liquidity constraint where debt service payment obligations cause a reduction in export earnings. The three channels collectively cause the fourth channels, which cause an indirect effect on public sector expenditure. However, his simulation model is simple and highly aggregative as well as well not corrected for endogeneity biases. An extension of the analysis by Ndung'u (1998), established that the external debt problem in Africa led to an investment stall reducing growth substantially. Additionally, he argued that once a country moves to the wrong side of the Laffer curve and does not reverse the trend the accumulated effects further affects growth.

However, Elbadawi, Ndulu, and Ndung'u (1997 and 1998), both had significant empirical challenges that implied unreliable model estimates. The problems included; numerous missing variables, some variables were dropped since they point towards inverse relationships from

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<sup>10</sup> Capital out ratio defines the relationship between level of investment and the corresponding economic growth

<sup>11</sup> Elbadawi et.al (1997) refers to the Laffer curve as the possible negative effect of debt on growth when the level of indebtedness is very high other than the amount of debt repayment and the size of debt.

<sup>12</sup> Elbadawi et.al (1997) refers to the existence of a large debt having a negative effect on investment and growth.

what is assumed in theory as well as highly significant t-ratios for other, lastly drastic changes in coefficient values as a result of minimal changes in inputs.

Clements, Bhattacharya, and Nguyen (2003), studied 55 low income countries for the period 1970 and 1999 providing empirical support for the debt overhang hypothesis. They used a fixed effect model as well as generalized method of moments as well as netted out the effects of short-term fluctuations by using three-year averages, which resulted, to a 30-37 per cent threshold level for debt to GDP and 115-120 per cent threshold for debt to exports ratio. However, the paper did not evaluate other macroeconomic channels through which external debt affects growth.

Pattilo, Poirson, and Ricci (2004), investigated the channels through which debt affects growth, specifically through factor accumulation or total factor productivity growth as well as tested for presence of nonlinearities in the effect of debt on the different channels. Using a data set of 61 developing countries over the period 1969–1998. The results indicated that the negative impact of high debt on growth operates both through a strong negative effect on physical capital accumulation and on total factor productivity growth. On average, for high-debt countries, doubling debt will reduce output growth by about 1 percentage point and reduce both per capita physical capital and total factor productivity growth by somewhat less than that. In terms of the contributions to growth, approximately one-third of the effect of debt on growth occurs via physical capital accumulation and two-thirds via total factor productivity growth which is consistent with (Fischer, 1993). The results are shown to be compatible with a simultaneous significant effect of growth on debt ratios, as suggested by Easterly (2001). Nevertheless, the three studies used a small data set that is not adequate to invoke econometrics assumptions.

Recent empirical studies on the relationship between public debt and GDP growth after the 2008 global financial crisis includes Kumar and Woo (2010), analysed 38 advanced and emerging markets data between 1970 to 2007 using estimator pooled OLS, fixed effects panel and SGMM dynamic panel regression. His results present a 0.2 per cent decrease in GDP per capital for emerging economies while advanced economies experience a 0.15 per cent decrease in GDP when the debt to GDP ratio increases by 10 per cent. However, the study only controlled for country size and government size effect leaving out key variables that affect GDP growth channels.

Cecchetti, Mohanty, and Zampolli (2011), analysed 18 OECD countries for the period 1980 – 2010 using dynamic fixed effects panel data regression established 85 per cent debt to GDP

ratio above which growth declines for both emerging and developed markets. A further 10 percentage point increase reduces trend growth by more than one-tenth of 1 percentage point. Despite the threshold, governments should maintain a rate lower than 85 per cent giving adequate flexibility in case of macroeconomic shocks. Nonetheless, they only examined the effect debt has on the GDP growth channel which is not sufficient.

### **2.2.2 Country-Specific Studies**

#### ***External Debt and Economic Growth***

Furthermore, some country specific studies reached different conclusions as compared to most studies which aggregated countries into regions. Sulaiman and Azeez (2012), examined the extent of external debt on economic growth of Nigeria for the period 1970 to 2010 using OLS, Augmented Dickey Fuller Unit Root test, Johansen Co-integration test and Error Correction Method. The cointegration test shows that long-run equilibrium relationship exists among the variables while the error correction method show that external debt has contributed positively to the Nigerian economy. Therefore, recommending that external debt should be acquired for economic reasons. Similarly, Suna (2015), examined the variables for Turkey applying VAR model to analyse Granger causality using data for the period 2003 to 2014 and conclude that external debt has a positive effect on economic growth for Turkey.

Jayaraman and Lau (2009) using a data set of six pacific island countries for the period 1988 to 2004 used OLS and established that a 1 per cent increase in external debt stock leads to a 0.25 per cent increase in national output. However, contrary to the study, Malik, Hayat, and Hayat (2010), examined the variables for the case of Pakistan using data between 1972 and 2003. Their results pointed out to a negative effect between the variables which is due to debt servicing burden having a negative effect on productivity of both capital and labour which is consistent with the findings of (Hameed, Ashraf, and Chaudhary, 2008) who also studied Pakistan.

Pescatori, Sandri, and Simon (2014), established no threshold and concluded debt trajectories should be monitored since countries with low debt levels growth at the same pace as countries with high but declining debt levels. Similarly, Eberhart and Presbitero (2015), found no specific threshold for public debt to GDP however he affirmed a negative effect in the long run for a high ratio after examining 118 advanced and developing economies for the period 1960-2012 using a dynamic non-linear model and a common correlated effects estimator.

From the above studies, it is evident that country specific studies do give different results from panel analysis that do not consider differences in structural and economic fundamentals.

### ***Domestic Debt and Economic Growth***

Despite limited literature on the relationship between debt and economic growth, a few research such as Christensen (2005), examined the effect of domestic debt on private sector for 27 countries in the SSA region including Kenya over the period 1980-2000 and it yielded a significant negative relationship: on average across countries, an expansion in domestic debt by 1 per cent leads to a 0.15 per cent decline in private sector which results to crowding out as initially suggested by Modigliani's (1961) theoretical model.

Abbas and Christensen (2007), built on Christensen (2005) by analysing 93 low-income countries and emerging markets over the period 1975-2004 to estimate the growth impact of domestic debt. Using a Granger causality regression model, the results suggest support for a variety of channels: improved monetary policy; broader financial market development; strengthened domestic institutions/accountability; and enhanced private savings and financial intermediation. In addition, at moderate levels of non-inflationary domestic debt as a share of GDP and bank deposits, was found to exert a positive overall impact on economic growth. However, evidence indicates that above a ratio of 35 per cent of bank deposits a further increase in domestic debt undermines growth.

Skeikh, Faridi, and Tariq (2010), analysed the relationship between the variables in Pakistan for the period 1972-2009 using an OLS estimation. The findings of the study revealed that the negative impact of domestic debt servicing on economic growth is stronger than the positive impact of domestic debt on economic growth.

In contrast with the above studies on the relationship between domestic debt on economic growth, Maana, Owino, and Mutai (2008), studied the variables using a Kenyan data set for the period 1996 to 2007 using a modified barro growth regression model. The results affirmed that due to considerable level of financial development in Kenya no evidence was established that the growth in domestic debt crowds out the private sector in Kenya. In addition, domestic debt expansion had a positive but not significant effect on economic growth during the period. Yet, this study had some limitations such as unreliable sample period.

Furthermore, Putunoi and Mutuku (2013), investigated the relationship between the variables was investigated using the Engle-Granger residual based and Johannes VAR based

cointegration tests using quarterly time series data spanning 2000 to 2010 for Kenya. The study showed that domestic debt expansion in Kenya, for the period of study, has a positive and significant effect on economic growth. In view of this, the study recommended that the Kenyan government should encourage sustainable domestic borrowing provided the funds are utilized in productive economic avenues. However, the data set was too small to draw reliable macroeconomic conclusions.

### **2.3 Research Gap**

Empirical studies focusing on the relationship between public debt and economic growth focusing on emerging economies were mainly done prior to the 2008 global financial crisis. Recent empirical literature focusing on the variables shifted in favour of developed economies that experienced an exponential increase in government debt after the crisis since governments tried to counter the effects of the crisis. Notwithstanding that the financial crisis questioned long standing macroeconomic beliefs and techniques thereby creating the need to evaluate studies done including recent data and macroeconomic developments. In addition, such analyses are more relevant to emerging economies, which are characterized by limited taxation capacities, strained revenues from inefficient government investments and reliance on debt to drive infrastructural and social developments.

Secondly, the varying results of the studies that included emerging economies particularly Kenya, necessitate the need for detailed studies that define stable and sustainable relationships between debt and economic growth considering differences country specific macroeconomic and structural frameworks. Therefore, since most studies are aggregated this study explored Kenya's case using a larger available data set as compared to previous studies.

Additionally, the effects of both domestic debt and external debt on economic growth have not been explored in a single study. Therefore, with an aim of guiding Kenya's policy decisions regarding the most effective source of government borrowing the study strived to explore the variables jointly to capture the effects of the different characteristics of the forms of debt on the macroeconomic environment.

Furthermore, most studies have been geared towards external debt, which the impact of domestic debt on economic growth remains mildly explored. Thus, this study extends empirical literature on external debt as well as explore domestic debt extensively using a wider available dataset. Most studies investigating the effect of domestic credit on the private sector in

developing economies tend to focus only on bank credit as opposed to other forms of credit. However, this study considered credit from the banks and cumulative debt from different other sources of the domestic economy such as the financial markets captured by two different models.

#### **2.4 Research Questions**

This study aims to answer the following questions:

- a) What is the effect of domestic debt versus external debt on economic growth?
- b) Does domestic debt crowd out of private investments in Kenya?

#### **2.5 Research Objectives**

Based on the above questions, the main objective of this study is to investigate the relationship between public debt and economic growth. This objective has been divided into two:

- a) The extent to which domestic and external debt has affected growth in the Kenya economy through various transmission channels such as total factor productivity, private consumption growth, capital growth and GDP growth.
- b) The private sector in Kenya heavily relies on bank credit, therefore the study investigates whether government debt crowds out the supply of credit to the private sector in Kenya from both banks and financial markets.



## CHAPTER 3

### 3.0 METHODOLOGY

#### 3.1 Research Design

The study was explanatory since it aimed to investigate whether aggregate, domestic and external public debt influences economic growth as well as the extent the effect in the short run as well as if government domestic debt crowds out the private sector.

GMM was an appropriate estimation methodology since endogeneity is inherent among the variables in the study. Since recessions can lead to increased public debt levels at the same time high public debt might lead to reduced growth (Easterly, 2001).

Additionally, the model also contained lagged dependent variables, which called for the use of Instrumental Variables. Thus, since GMM does not require strong assumptions on the underlying data generating process therefore it was better than other instrumental variables.

#### 3.1.2 Justification of Variables

Empirical studies suggest four main channels through which public debt affects economic growth namely; GDP growth, Total factor productivity, Capital growth and Private consumption growth.

GDP growth implies the changes in the monetary value of goods and services produced within a country's boundaries. It is used as a gauge of balance of trade and standards of living improvement and measures the direct impact of debt on growth. Secondly, Household final expenditure per capita growth was used as a proxy for private consumption which represents ability of households to smoothen consumption. This is because public debt used effectively improves human capital and technology, aids in consumption smoothing across generations as well as reduces macroeconomic volatility.

Additionally, total factor productivity captures potential benefit the economy gets from investing in technology using debt financing. Capital growth which directly as well as indirectly through increasing efficiency of labour in turn potentially leads to a positive economic growth.

Additionally, to address the effect of government borrowing on private sector investments the main variables considered were private credit defined as claims on the private sector by deposit

money banks and other financial institutions and claims on central bank by deposit money banks and other financial institutions.

To ensure that the study was more coherent fundamental variables of economic growth were controlled for which, is consistent with Kumar and Woo (2010) and Kilman (2016). The variables included: Population as a proxy for country size, Government consumption expenditure as a proxy for government size, education expenditure representing investment in human capital, age dependent since as the population structure changes with increasing age dependencies it puts an upward pressure on savings and I turn affecting debt and growth. The effects of monetary policy are captured by current account balance changes, broad money and the rate. Inflation was also included as it devalues the stock of outstanding debt (Emran and Farazi, 2008).

### 3.2 Population and Sample

The population analysed in this study was the Kenyan economy using aggregate data for the variables mentioned in the research design. The study period was between 1971-2015, which is a total of 50 years.

### 3.3 Data

The study will use secondary data mainly from Central Bank of Kenya, International Monetary Fund and World Bank. Capital stock was derived from data on gross share capital formation similar to Kilman (2016).

### 3.4 Model

This study intends to model the effect of public debt on economic growth using four main models and a fifth model to investigate whether domestic debt crowds out private investments.

**Model 1: Direct effect of debt on economic growth rate that is GDP (Y) growth**

$$\Delta \ln Y_{i,t} = \alpha_{it} + \gamma_y \Delta D_{i,t-l} + \delta_y \Delta D_{i,t-l}^2 + \theta_y \Delta X_{i,t} + \varepsilon_{i,t}$$

**Model 2: Effect of debt on Total Factor Productivity (A)**

$$\Delta \ln A_{i,t} = \alpha_{it} + \gamma_y \Delta D_{i,t-l} + \delta_y \Delta D_{i,t-l}^2 + \theta_y \Delta X_{i,t} + \varepsilon_{i,t}$$

**Model 3: Effect of debt on Capital Stock (K)**

$$\Delta \ln K_{i,t} = \alpha_{it} + \gamma_y \Delta D_{i,t-l} + \delta_y \Delta D_{i,t-l}^2 + \theta_y \Delta X_{i,t} + \varepsilon_{i,t}$$

**Model 4: Effect of debt on Private Consumption (C)**

$$\Delta \ln C_{i,t} = \alpha_{it} + \gamma_y \Delta D_{i,t-l} + \delta_y \Delta D_{i,t-l}^2 + \theta_y \Delta X_{i,t} + \varepsilon_{i,t}$$

**Model 5: Effect of domestic debt on Private Credit (Q)**

$$\Delta \ln Q_{i,t} = \alpha_{it} + \gamma_y \Delta D_{i,t-l} + \delta_y \Delta D_{i,t-l}^2 + \theta_y \Delta X_{i,t} + \varepsilon_{i,t}$$

$$\Delta \ln Q_{i,t} = \alpha_{it} + \gamma_y \Delta P_{i,t-l} + \delta_y \Delta P_{i,t-l}^2 + \theta_y \Delta X_{i,t} + \varepsilon_{i,t}$$

Where:

$$l = 0,1$$

$D_{i,t-l}$ : A vector of two debt variables which are: domestic debt and external debt.

$D_{i,t-l}^2$ : The square of the debt variables and captures non-linearity of the debt variables (Kilman, 2016).

$P_{i,t-l}$ : A vector of two lagged debt variables which are: claims on CBK (credit from the banking sector) and external debt.

$P_{i,t-l}^2$ : The square of the lagged debt variables and captures non-linearity of the debt variable

$X_{i,t}$ : A vector of control variables such as population, age dependency, government consumption, inflation, national savings, current account balance, broad money supply (M3), private credit, education expenditure and interest rate. These explanatory variables have been shown empirically to be robust determinants of real growth by prior empirical studies.

## CHAPTER 4

### 4.0 EMPIRICAL RESULTS

#### 4.1 Descriptive Statistics

To start, Figures 4.1 illustrates line plots for the relationship between public domestic debt and public external debt with the main dependent variables: GDP growth rate, total factor productivity, capital stock, private consumption, credit to private sector from deposit money banks and credit to government from deposit taking banks. Before analysis the data was transformed into logarithmic to reduce sparse however, variables that are in ratio or percentage form were not transformed.

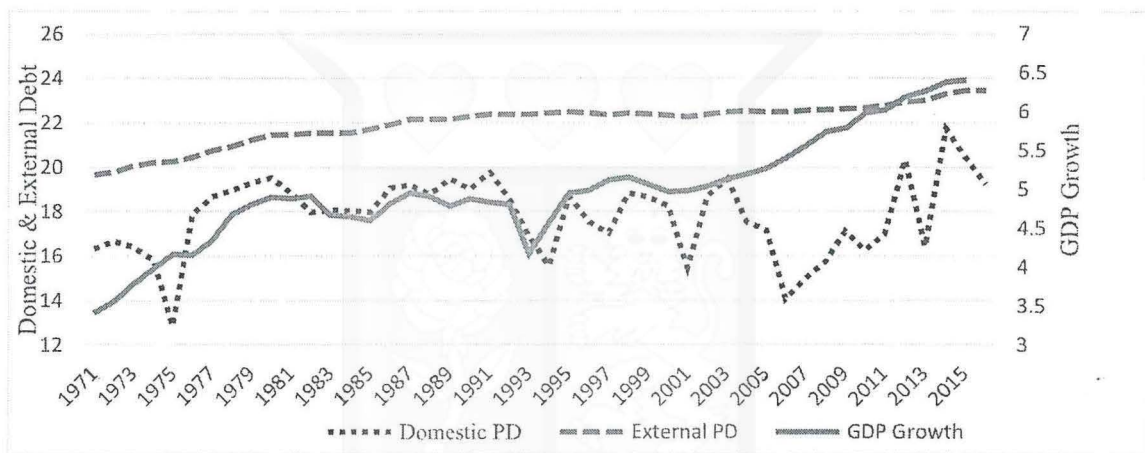


Figure 3(a): Domestic Debt, External Debt and GDP Growth

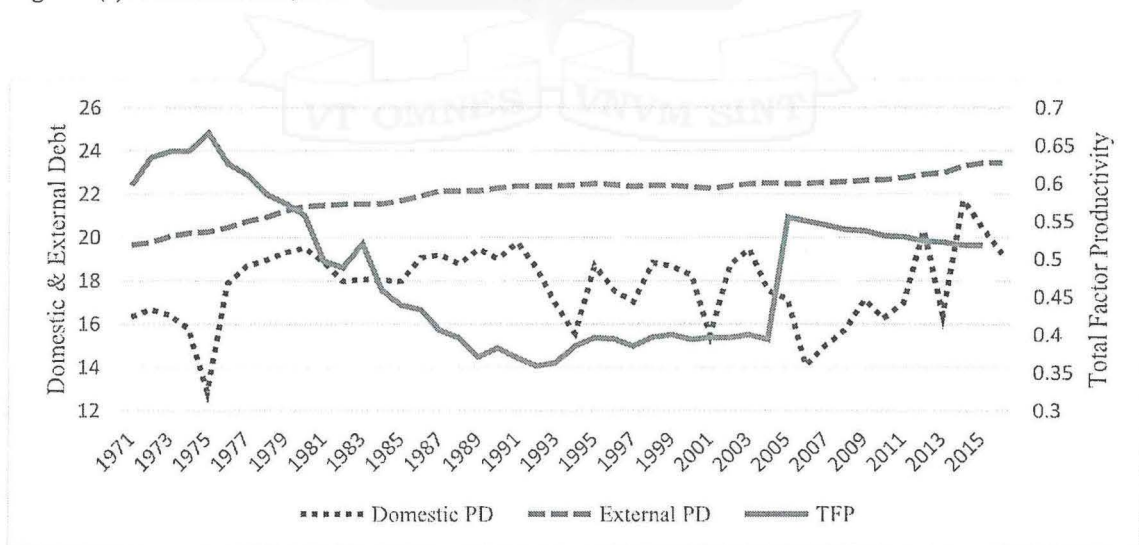


Figure 3(b): Domestic Debt, External Debt and Total Factor Productivity

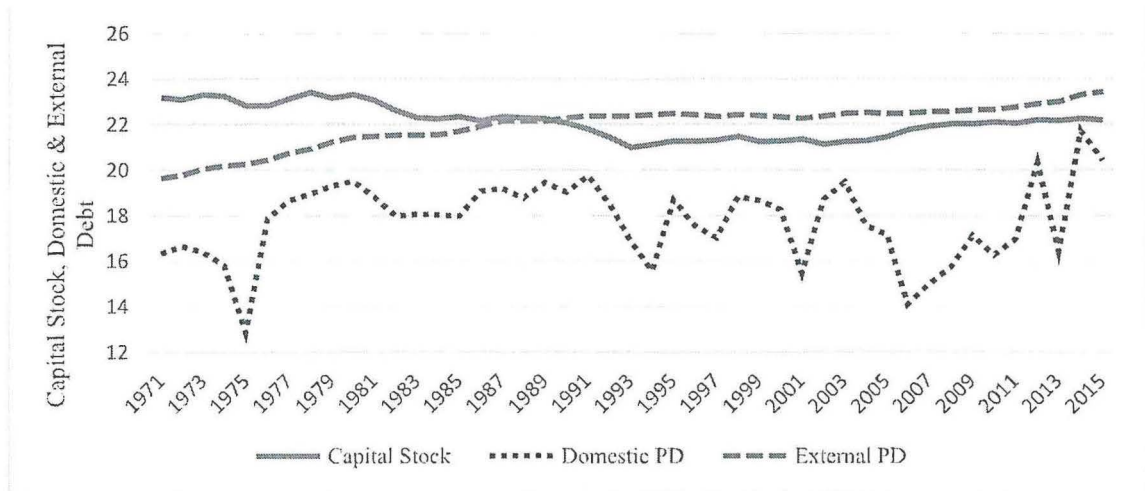


Figure 3(c): Domestic Debt, External Debt and Capital Stock

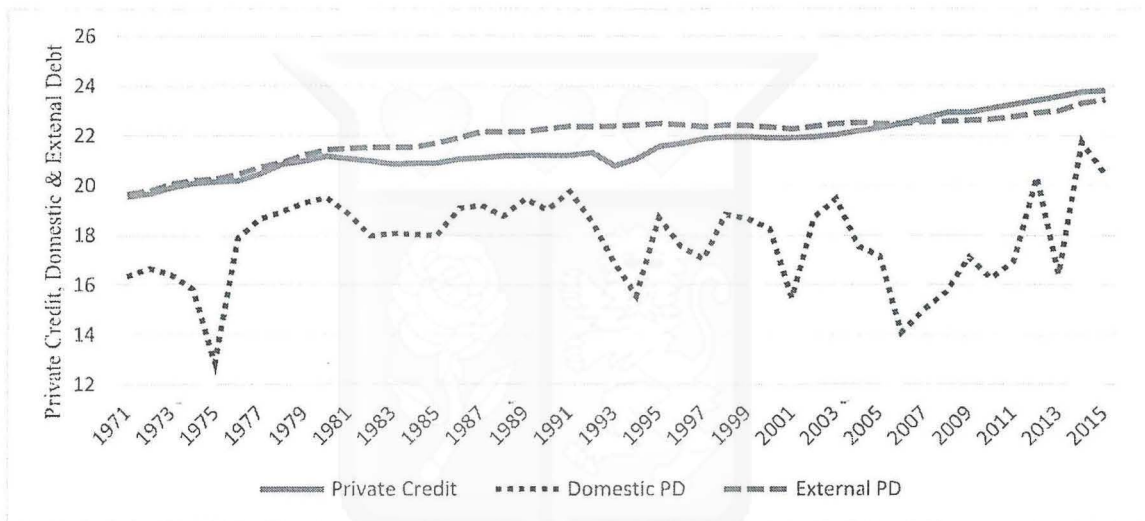


Figure 3(d): Domestic Debt, External Debt and Private Credit

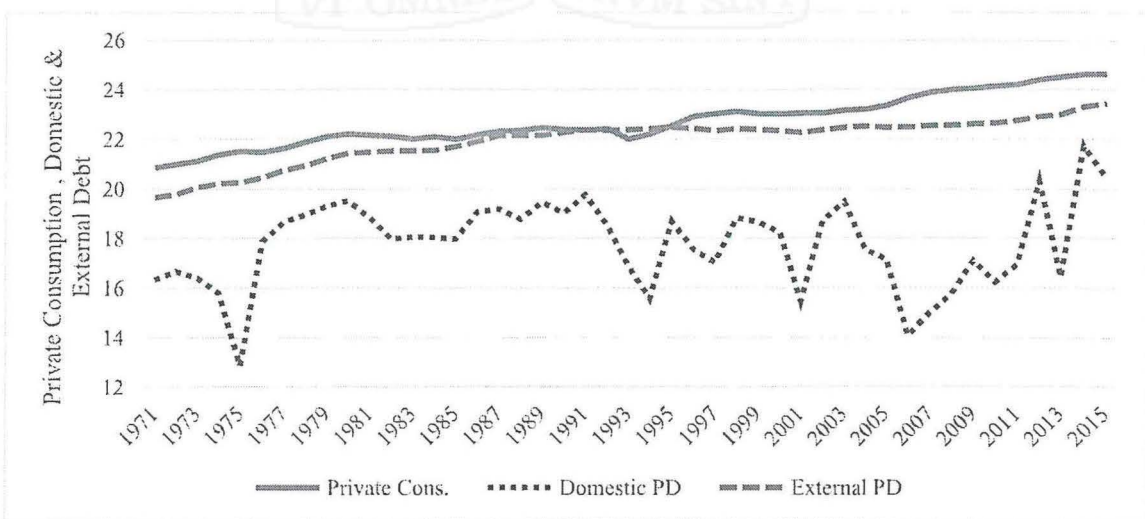


Figure 3(e): Domestic Debt, External Debt and Private Consumption

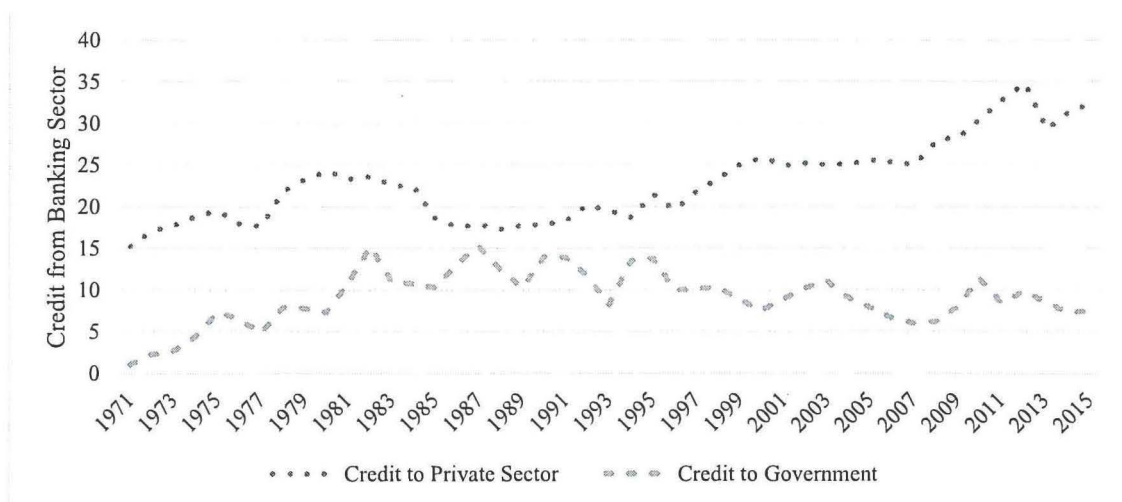


Figure 3(f): Credit from deposit money institutions (% of GDP) to: Private sector and Government

The relationships between the variables are unclear. However, domestic debt seems more volatile as compared to external debt. Figure 4.2 is the summary statistics for the main variables.

#### 4.2 Results Interpretation

Variable	GDP Growth		TFP		Capital Stock		Private Cons.		Private Credit	
	Coef.	p-val	Coef.	p-val	Coef.	p-val	Coef.	p-val	Coef.	p-val
Constant	30.05	0.000*	-0.873	0.018*	0.401	0.039*	0.049	0.041*	-0.093	0.605
External	3.697	0.018*	0.106	0.232	-0.290	0.638	-0.081	0.375	0.551	0.6118
Domestic	-0.425	0.627	0.366	0.768	-0.552	0.026*	-0.135	0.275	-1.327	0.575
L(External)	-0.288	0.616	0.124	0.722	-0.050	0.530	0.035	0.357	-0.005	0.062
L(Domestic)	2.162	0.087	-0.135	0.359	-0.156	0.638	0.132	0.088	0.027	0.052
Domestic ^2	-1.928	0.049*	0.582	0.889	-0.552	0.525	0.132	0.173	0.095	0.053
External ^ 2	-7.457	0.218	0.956	0.478	1.171	0.832	-0.079	0.856	0.131	0.988
CA Balance	0.116	0.209	-0.042	0.034*	0.066	0.818	0.021	0.018*	-0.004	0.319
Govt. Cons.	0.027	0.982	0.321	0.884	-0.110	0.629	0.011	0.921	-0.297	0.545
Inflation	0.089	0.521	0.034	0.182	0.028	0.528	-0.001	0.893	0.023	0.028*
Broad Money	-0.024	0.982	-0.173	0.350	-0.939	0.784	0.058	0.710	0.026	2.250
National Savings	-0.454	0.521	0.020	0.251	0.127	0.816	-0.137	0.004*	-0.144	0.123
Population	-2.170	0.013*	1.780	0.194	-15.30	0.032*	1.19	0.046*	-2.684	0.185
Interest Rates	0.954	0.774	0.063	0.271	-0.261	0.393	0.039	0.778	-0.274	0.003*
Age Dependency	31.032	0.241	16.658	0.024*	3.018	0.875	-0.465	0.629	-4.51	0.038*
Education	-0.650	0.157	-0.384	0.330	0.738	0.032*	-0.048	0.382	0.287	0.527
Trade	0.119	0.678	0.200	0.023*	0.644	0.213	-0.123	0.115	0.266	0.098*
J-statistic	0.0000		7.26E-42		0.0000		0.0000		0.000	
Jacque Berra	0.7936		0.8196		0.5745		0.1956		0.8538	
Probability	0.6725		0.6638		0.7503		0.9068		0.6525	

Table 1: Summary Results

#### 4.2.1 Interpretation of Regression Output results for GDP growth

The study estimated the effect of external debt and domestic debt as well as corrected for other macroeconomic variables on GDP Growth. The estimation results are discussed below.

$$GDP\ Growth = 30.054 + 3.697External - 1.928(Domestic)^2 - 2.171Population + \varepsilon_t$$

(Equation I)

At 5% confidence interval, the estimation results pointed towards strong evidence of statistical significance of external debt, domestic debt and population in explaining GDP growth. The signs of the estimated coefficients were inconsistent with the expectation from economic theory, most control variables were expected to be significant. This is because of the study breaking GDP into its specific components the significance of other factors was captured by other dependent variables.

External debt was found to have a direct positive and significant effect of GDP growth while domestic debt negatively affected GDP growth but in an indirect manner. The positive effect of external debt on economic growth showed that there is no existence of debt overhang effect in Kenya from external debt. However, borrowing from the domestic market has negative effects on GDP growth.

#### 4.2.2 Interpretation of Regression Output results for TFP

The study estimated the effect of external debt and domestic debt as well as corrected for other macroeconomic variables on TFP. The estimation results are discussed below.

$$TFP = -0.873 - 0.042Capital\ Account\ Balance + 16.65Age\ Dependency + 0.2Trade + \varepsilon_t \quad (Equation\ II)$$

At 5% confidence interval, the estimation results pointed towards strong evidence of statistical significance of current account balance and age dependency in explaining TFP. Age dependency pointed out towards a positive relationship while current account balance negatively affects TFP according to the study. There was no statistical evidence that public debt affects economic growth through the TFP channel.

#### 4.2.3 Interpretation of Regression Output results for Capital stock

The study estimated the effect of external debt and domestic debt as well as corrected for other macroeconomic variables on capital stock. The estimation results are discussed below.

$$\text{Capital Stock} = 0.401 - 0.552\text{Domestic} - 15.304 \text{Population} + 0.738 \text{Education} + \varepsilon_t$$

(Equation III)

At 95% confidence interval, domestic debt and population pointed towards a negative relationship with capital stock, however education has a positive effect, this is consistent with theory. Therefore, domestic debt has a negative direct relationship with capital stock with a coefficient of (0.552). Furthermore, the model had a significant J-statistic meaning it is a valid GMM model.

#### 4.2.4 Interpretation of Regression Output results for Private Consumption

The study estimated the effect of external debt and domestic debt as well as corrected for other macroeconomic variables on private consumption. The estimation results are discussed below.

$$\text{Private consumption} = 0.049 + 0.021 \text{Current Account Balance} + 1.19 \text{Population} - 0.137 \text{National Savings} + \varepsilon_t$$

(Equation IV)

The final channel in the study that seeks to find if public debt significantly affects economic growth was private consumption. At 95% confidence interval capital account balance, population and national savings were found to have a significantly affect private consumption. Public debt does not affect economic growth significantly through the private consumption channel. This is inconsistent to the Ricardian equivalence that postulates that an increase in debt to fund government deficits will lead to expectations of future increases in taxes making individuals save more on consume less at the time.

#### 4.2.5 Interpretation of Regression Output results for Private Credit

The study estimated the effect of external debt and domestic debt as well as corrected for other macroeconomic variables on private credit. The aim was to find out the existence of crowding out effect of private investment due to borrowing excessively and vulnerability of private credit to other macroeconomic variables. Therefore, the evidence seeks to explain important links between fiscal policy and private investments. The estimation results are discussed below.

$$\text{Private credit} = 0.023 \text{ Inflation} - 0.274 \text{ Lending Interest Rate} - 4.51 \text{ Age dependency} + 0.266 \text{ Trade} + \varepsilon_t \quad (\text{Equation V})$$

According to the liquidity constraints theory, when a country's domestic debt burden is so heavy that a significant portion of its current output accrues to lenders, it crowds out private investment (Ngugi, 2016). However, from the estimation results, total domestic debt, at 95% confidence interval does not crowd out private credit in turn private investments.

Other variables that showed strong statistical significance in this relationship were: inflation and trade which were positive as well as interest rate and age dependency that were negative which is consistent with theory. A significant J-statistic proves that the model is reliable.

The study went further to investigate the relationship between private credit to private investors in from the banking sector and credit form the banking system to the government since the private sector is highly reliant on banks for credit. This was to cross-validate the results above considering Kenya's economic structure.

The results were consistent and there was no statistical significant evidence that government debt crowds out private investments even if they only borrow from deposit money institutions.

Variable (test statistic = 0.694)	Credit from Banking Sector	
	Coef.	p-value
Constant	35.099	0.078
Claims on CBK	0.259	0.907
L (Claims on CBK)	-0.435	0.267
Claims on CBK ^2	-0.051	0.653
CA Balance	0.709	0.024*
Govt. Cons.	-11.380	0.198
Inflation	-2.221	0.075
Broad Money	0.645	0.060
National Savings	-3.948	0.202
GDP Per Capita	15.001	0.030*
Interest Rates	8.742	0.045*
Age Dependency	-11.57	0.926
Trade	0.266	0.048*
J-statistic	3.89E-40	
Jacque Berra	3.3937	
Probability	0.1833	

Table 2: Summary Results for Credit from Banking Sector

$$\text{Private credit from banking sector} = 0.709 \text{ CA Balance} + 15.001 \text{ GDP Per capita} + 8.742 \text{ Interest Rate} + 0.266 \text{ Trade} + \varepsilon_t \quad (\text{Equation VI})$$

Additionally, private credit from deposit money institutions had no statistical significant relationship with any other variable in the study.

## CHAPTER 5

### 5.0 SUMMARY

#### 5.1 Summary of Findings

The objectives of the studies were to determine the effect of public debt on economic growth through various channels as well as determine whether it crowds out private investments which ideally is an indirect channel leading to economic growth. Four main direct channels were studied: GDP growth, TFP, capital stock and Private Consumption. The study also examined whether economic growth channels and private credit were affected indirectly and considered possible lag effects. In examining private credit, the study applied two models: the first one used total private credit from all sectors of the economy and a second model that focused only on credit from deposit taking banks. That accounts for a private sector that is heavily reliant on banks for credit and shallow fixed income markets that make it hard for companies to float bonds. Additionally, to ensure legitimate results the study controlled for other macroeconomic variables and ran robustness checks on the data and on the models.

Based on the results there is no empirical evidence that public debt affects economic growth through TFP and capital private consumption channel. The GDP growth model pointed towards a significant relationship directly with external debt and indirectly with domestic debt. If external debt increases by one percentage point GDP growth increases by 3.697. This is consistent with theoretical models such as the Harrod Domar model that advocates that savings is necessary for stimulating growth in countries and for countries with low savings level should find ways to finance the gap. Therefore, external debt facilitates growth since it covers the financing gap in Kenya which has low savings. Domestic debt on the other hand pointed towards a negative indirect relationship which is consistent to previous studies done for Kenya investigating the relationship between domestic debt and economic growth such as Ngugi (2016).

Capital stock is affected by only domestic debt directly, the relationship is negative. A one percentage point increase in domestic debt leads to a 0.552 reduction in capital stock. This phenomenon can be because of a reduction in investment in capital stock due to sub-optimal allocation of resources by a government characterized by inefficiencies. It reduces the amount of money available for the private sector to invest in capital stock and debt servicing puts a burden on the taxpayers further reducing the resources they can allocate to capital formation. However, this is inconsistent with empirical studies done for advanced economies that have

shown a positive relationship between domestic debt and capital stock as their government's purpose to allocate resources optimally and reduce leakages.

Moreover, there was not only an insignificant relationship between private credit and domestic debt but also between credit from deposit taking institutions to the private and public sectors. This is consistent with Maana et al (2008), affirming that due to considerable level of financial development in Kenya no evidence was established that the growth in domestic debt crowds out the private sector in Kenya. In addition, domestic debt expansion had a positive but not significant effect on economic growth during the period.

Cumulatively, external debt was found to have a significant positive impact on economic growth through the GDP growth channel but domestic debt has a negative significant impact through both the growth channel and capital stock. Therefore, in as much as no statistically significant relationship was established between private credit and domestic credit, domestic debt still leads to a negative impact on economic growth. This negates Maana et al (2008) and Putunoi and Mutuku (2013) recommendations that the Kenyan government should encourage sustainable domestic borrowing since it doesn't affect private investments

## **5.2 Conclusion**

The study was conducted with a view to establishing the effect of public debt on economic growth in Kenya over the period 1971-2015. It considered the main channels through which economic growth can be affected by growth and established indirect effects through private credit channel which is assumed to directly influence private investments.

The study controlled for government size, economy size, human capital, monetary policy, changes in population structure and trade openness. Using the times series regression model, the effect was analysed and diagnostic tests were carried out to ensure the data was stationary. The study used GMM and carried out model diagnostic tests such as residual diagnostic tests and Sargan Hansen J-Test to ensure validity of the models.

The main findings of the study confirmed with statistical significance that increasing the levels of domestic debt leads to decreased GDP growth rate and capital stock however, external debt leads to increased GDP growth levels. The other dependent variables did not have significant relationships with the independent variables. Therefore, the study suggests that the government should use external debt other than domestic debt to drive economic growth.

### **5.3 Recommendations and Policy Implications**

In conclusion, the government should externally source of funds to fill budget deficits. However, they should ensure that the level of external debt remains sustainable to avoid high external interest payments that will increase the country's budget deficit, as a result of reducing public savings in a country with inadequate private savings. Debt service may discourage growth by squeezing the public resources available for investment in infrastructure and human capital Clements et al., (2005).

Secondly, the government should strive to reduce the current level of domestic debt to prevent further negative effects on the economy. The domestic debt trajectory should be worrying to policy makers. Measures such as increasing government revenue to reduce budget deficit that in turn will lead to a lower demand for domestic credit should be implemented. This validates Ngugi (2016), recommendation that there is a need for proper management of resources of the economy since it determines the volume and servicing of external debt and domestic debt.

Furthermore, the Kenyan government should strive to increase effectiveness of its institutions to ensure that public debt translates to a significant positive effect on all four main channels. In developed countries GDP growth, TFP, capital stock and private consumption are positively affected by public debt since their governments have managed to reduce leakages. This calls on policies that will ensure optimal allocation of resources through financing the most productive sectors of the economy and to promote their effectiveness through checks and balances to prevent corruption and ensure transparency.

### **5.4 Recommendations for Further Studies**

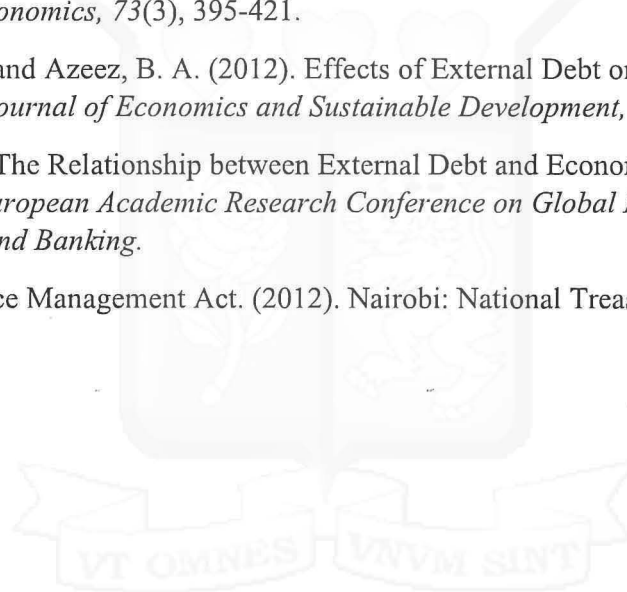
This study did not consider qualitative factors especially political factors that play a key role in the dynamics of debt in the country. Therefore, further studies should take such accounts into account. Secondly, further studies should also focus on private credit affecting the main channels through which economic growth is affected to give policymakers a clearer picture as to which sector, private or public, is more effective.

## Bibliography

- Abbas, A. S., and Christensen, J. E. (2007). *The Role of Domestic Debt Markets in Economic Growth: An Empirical Investigation for Low-income Countries and Emerging Markets*. IMF, African Department.
- Barro, R. J. (1979, October). On the Determination of Public Debt. *The Journal of Political Economy*, 87(5), 940-971.
- Barro, R. J. (1989). The Ricardian Approach to Budget Deficits. *The Journal of Economic Perspectives*, 3(2), 37-54.
- Baum, C. F., Schaffer, M. E., and Stillman, S. (2003). Instrumental Variables and GMM: Estimation and Testing. (D. f. Economics, Ed.)
- Cecchetti, S. G., Mohanty, M. S., and Zampolli, F. (2011). *The Real Effects of Debt*. Bank for International Settlements, Monetary and Economic Development.
- Christensen, J. (2005). *Domestic Debt Markets in Sub-Saharan Africa*. IMF, African Department.
- Clements, B., Bhattacharya, B., and Nguyen, Q. (2003). *External Debt, Public Investment and Growth in Low-Income Countries*. IMF, Fiscal Affairs Department. IMF.
- Diamond, P. A. (1965, December). National Debt in a Neoclassical Growth Model. *The American Economic Review*, 1126-1150.
- Easterly, W. R. (2001). Growth Implosions and Debt Explosions: Do Growth Slowdowns Cause Public Debt Crises? (B. E. Press, Ed.) *Contributions to Macroeconomics*, 1(1), 1-24.
- Eberhart, M., and Presbitero, A. F. (2015). Public Debt and Growth: Heterogeneity and Non-Linearity. *Journal of International Economics*, 97, 45-58.
- Elbadawi, I., Ndulu, B., and Ndung'u, N. (1997). External Finance for Low Income Countries in Sub-Saharan Africa. In IMF, I. Zubair, and R. Kanbur (Eds.), *Debt Overhang and Economic Growth* (pp. 49-76). Washington: IMF Institute.
- Emran, S. M., and Farazi, S. (2008). *Government Borrowing and Private Credit: Evidence from Developing Countries*. Washington: World Bank.
- Fischer, S. (1993, December). The Role of Macroeconomic Factors in Growth. *NBER working papers* (4565).
- Fisher, S. (1991). Macroeconomics, Development and Growth. *NBER Macroeconomics Annual*, 329-364.
- Gill, I., and Pinto, B. (2005). *Public Debt in Developing Countries: Has the Market - Based Model Worked*. World Bank, Development of Economic Policy and Debt.
- Gilles, S.-P. (1992). Fiscal Policy in an Endogenous Growth Model. *Quarterly Journal of Economics*, 107(4), 1243-1259.
- Haavelmo, T. (1945). Multiplier Effects of a Balanced Budget. *Econometrica*, 13(4), 311-318.

- Hameed, A., Ashraf, H., and Chaudhary, M. A. (2008). External Debt and Its Impact on Economics and Business Growth in Pakistan. *International Research Journal of Finance and Economics* (20), 132-140.
- Herndon, T., Ash, M., and Pollin, R. (2013). Does High Public Debt Consistently Stifle Economic Growth? A critique of Reinhart and Rogoff. *Cambridge Journal of Economics*, 1-23.
- IMF and IDA. (2016). *Debt Sustainability Analysis Update*. Washington.
- Jayaraman, T. K., and Lau, E. (2009). Does External Debt Lead to Economic Growth in Pacific Island Countries? *Journal of Policy Modelling*, 31(2), 272-288.
- Kilman, J. (2016). Government, Household and Corporate Debt: The effect on Growth. *School of Economics and Management*.
- Kumar, M. S., and Woo, J. (2010). *Public Debt and Growth*. IMF, Fiscal Affairs Department. IMF.
- Maana, I., Owino, R., and Mutai, N. (2008). Domestic Debt and its Impact on the Economy - The Case of Kenya. *Annual African Econometric Society Conference*. Pretoria.
- Malik, S., Hayat, M. K., and Hayat, M. U. (2010). External Debt and Economic Growth: Empirical Evidence from Pakistan. *International Research Journal of Finance and Economics*, 88-97.
- Meade, J. E. (1958, June). Is the National Debt a Burden? *Oxford Economic Papers*, 163-183.
- Modigliani, F. (1961, December). Long-run Implications of Alternative Fiscal Policies and the burden of the National Debt. (R. E. Society, Ed.) *The Economic Journal*, 71(284), 730-755.
- Ndung'u, N. S. (1998). *Dynamic Impact of external Debt Accumulation on Private Investment and Growth in Africa*. Addis Ababa: IMF.
- Nelson, R. M., Belkin, P., and Mix, D. K. (2010). *Greece's Debt Crisis: Overview, Policy Responses and Implications*. Athens: Congressional Research Service.
- Ngugi, W. N. (2016). Effect of Public Debt on Economic Growth in Kenya.
- Njenga, E. (2014). The Effects of Devolved Funds on Economic Growth in Kenya; An Empirical Investigation. *School of Economics, University of Nairobi*.
- Nyandemo, S. M. (2017). The National Debt Controversy. *ICPAK Economic Symposium*. Nairobi.
- Pattilo, C., Poirson, H., and Ricci, L. (2004, January). What are the channels through which external debt affects growth? *IMF Working paper*.
- Pescatori, A., Sandri, D., and Simon, J. (2014). *Debt and Growth: Is there a magic threshold?* IMF, Research Department. IMF.

- Peston, M. H., and Baumol, W. J. (1955). More on the Multiplier Effects of a Balanced Budget. *The American Economic Review*, 45(1), 140-145.
- Putunoi, G. K., and Mutuku, C. M. (2013, June). Domestic Debt and Economic Growth Nexus in Kenya. *Current Research Journal of Economic Theory*.
- Reinhart, C. M., and Rogoff, K. S. (2012). Growth in a Time of Debt. *American Economic Review*, 100(2).
- Sargan, J. (1958). The Estimation of Economic Relationships using Instrumental Variables. *Econometrica*, 393-415.
- Sheikh, M. R., Faridi, M. Z., and Tariq, K. (2010, December). Domestic Debt and Economic Growth in Pakistan; An Empirical Analysis. *Pakistan Journal of Social Sciences*, 30(2), 373-387.
- Smetters, K. (1999, September). Ricardian Equivalence: Long-run Leviathan. *Journal of Public Economics*, 73(3), 395-421.
- Sulaiman, L. A., and Azeez, B. A. (2012). Effects of External Debt on Economic Growth of Nigeria. *Journal of Economics and Sustainable Development*, 3(8).
- Suna, K. (2015). The Relationship between External Debt and Economic Growth in Turkey. *Second European Academic Research Conference on Global Business, Economics, Finance and Banking*.
- The Public Finance Management Act. (2012). Nairobi: National Treasury.



## APPENDIX

### *Appendix 1: Derivation of Capital Stock ( $K_t$ ) from capital formation ( $K_{t-1}$ )*

$$K_t = K_{t-1}(1 - d_1) + g_1(K_{t-1})$$

Where:  $d_1$  – Constant depreciation of capital assumed to be 0.5 (Kilman, 2016)

$g_1$  – Average growth rate of capital formation over the period

### *Appendix 2: Diagnostic Tests*

#### *2.1 Variable Diagnostic Tests*

##### **Tests for stationarity**

Time series techniques assumes that the data is stationary. Therefore, to ensure reliable results, the study employed the Augmented Dickey Fuller (ADF) and Kwiatkowski Phillips Schmidt-Shin (KPSS) tests procedure considering both tests with intercepts and with intercepts and trends.

In as much as ADF test is a standard procedure conducted to test whether a series has a unit root, KPSS is more superior since it eliminates the possible low power against stationary near unit root processes; which occur in the Augmented Dickey Fuller (ADF) (Gujarati, 2003).

##### ***Hypothesis Tested:***

*Null Hypothesis: The series is stationary*

*Alternative Hypothesis: The series is non-stationary*

##### ***Stationarity Tests Results***

ADF Null Hypothesis: The series has a unit root

KPSS Null Hypothesis: The series is Stationary

		ADF	KPSS
Asymptotic Critical Value at 95% CI	Intercept	-2.9297	0.463
	Intercept + Trend	-3.5155	0.146

Variable	Type of Test	ADF P-values	Conclusion	KPSS P-values	Conclusion
Domestic	Intercept	-5.8900	Stationary	0.1312	Stationary
	Intercept Trend	-5.8180	Stationary	0.1320	Stationary

<b>External</b>	Intercept	-3.6393	Stationary	0.3653	Stationary
	Intercept + Trend	-3.7841	Stationary	0.2032	Stationary
<b>GDP</b>	Intercept	-4.5793	Stationary	0.1631	Stationary
	Intercept + Trend	-4.2129	Stationary	0.1629	Non-stationary
<b>Private Consumption</b>	Intercept	-4.9753	Stationary	0.0822	Stationary
	Intercept + Trend	-4.9188	Stationary	0.0776	Stationary
<b>Capital Stock</b>	Intercept	-5.0037	Stationary	0.2840	Stationary
	Intercept + Trend	-5.1456	Stationary	0.1010	Stationary
<b>Private Credit</b>	Intercept	-5.1456	Stationary	0.1385	Stationary
	Intercept + Trend	-5.3636	Stationary	0.1190	Stationary
<b>TFP</b>	Intercept	-5.5610	Stationary	0.1975	Stationary
	Intercept + Trend	-4.4439	Stationary	0.1504	Stationary
<b>Age dependency</b>	Intercept	-5.7580	Stationary	0.1009	Stationary
	Intercept + Trend	-5.6984	Stationary	0.0792	Stationary
<b>Current Account Balance</b>	Intercept	-6.7313	Stationary	0.2035	Stationary
	Intercept + Trend	-6.8956	Stationary	0.0442	Stationary
<b>Inflation</b>	Intercept	-5.0022	Stationary	0.0995	Stationary
	Intercept + Trend	-5.1482	Stationary	0.0651	Stationary
<b>Education</b>	Intercept	-4.8939	Stationary	0.1139	Stationary
	Intercept + Trend	-4.8118	Stationary	0.0905	Stationary
<b>Savings</b>	Intercept	-7.5161	Stationary	0.5000	Non-stationary
	Intercept + Trend	-7.4520	Stationary	0.5000	Stationary
<b>Interest Rate</b>	Intercept	-5.8915	Stationary	0.1367	Stationary
	Intercept + Trend	-5.8273	Stationary	0.1325	Stationary
<b>Trade</b>	Intercept	-5.6045	Stationary	0.1041	Stationary
	Intercept + Trend	-5.5836	Stationary	0.1034	Stationary
<b>Broad Money</b>	Intercept	-5.6899	Stationary	0.1214	Stationary
	Intercept + Trend	-5.6271	Stationary	0.1140	Stationary
<b>Claims on CBK</b>	Intercept	-3.8882	Stationary	0.4246	Stationary
	Intercept + Trend	-4.8214	Stationary	0.1830	Non-Stationary

## 2.2 Times Series Models Diagnostic Test

### Residual Diagnostic Tests

The study carried out whether the residuals are white noise to affirm that the models are fully adequate. The residuals should have no autocorrelation and follow a normal distribution. The tests make use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from them.

The Breusch–Godfrey serial correlation was used to test for autocorrelation in the errors in a regression model.

***Breusch–Godfrey Hypothesis:***

*Null Hypothesis:* No serial correlation of any order up to ( $p$ ).

*Alternative Hypothesis:* Serial correlation of any order up to ( $p$ ).

Histogram Normality Test was used to test whether the residuals follow a normal distribution. Its null hypothesis is that the residuals are normally distributed.

***Histogram Normality Hypothesis:***

*Null Hypothesis:* Normal distributed

*Alternative Hypothesis:* Non-normal distribution

**Model Diagnostic Tests**

***Sargan-Hansen J-Test***

According to Kilman (2016), the GMM estimator is consistent, but like other instrumental variable approaches suffers from poor small sample properties as it is difficult to find truly exogenous instruments in finite samples. Furthermore, in GMM estimation, instrumental variables must satisfy two requirements to be relevant and valid that is: it must be correlated with the included endogenous variables, and orthogonal to the error process (Baum, Schaffer, and Stillman, 2003).

The study used the Sargan-Hansen J-Test to test whether the instruments satisfy orthogonality conditions in the context of an over identified model. The test assumes that model parameters are identified via a priori restrictions on the coefficients, and tests the validity of over-identifying restrictions (Sargan, 1958). The test statistic was computed from residuals of instrumental variables regression by constructing a quadratic form based on the cross-product of the residuals and exogenous variables.

***Hypothesis Tested:***

*Null Hypothesis:* Over-identifying restrictions are valid (The model is valid)

*Alternative Hypothesis:* Over-identifying restrictions are invalid (The model is invalid)

The test statistic is asymptotically distributed as a chi-square variable with ( $m-k$ ) degrees of freedom. Where  $m$  is the number of instruments and  $K$  is the number of endogenous variables.

### ***Diagnostic Tests Conclusion***

All the p-values of the histogram- normality test was greater than 0.05 meaning that the null hypothesis that the residuals are normally distributed is accepted and neither the ACF nor the PACF had a significant lag. Therefore, according to Breusch-Godfrey serial correlation test and Histogram-normality test all models are statistically sound implying that their P-values are dependable. Further, the Sargan-Hansen J-test statistic implied that all the GMM models are valid that is the instruments satisfy orthogonality conditions of an over identified model, hence it is reliable.

