THE RELATIONSHIP BETWEEN LONG-TERM PUBLIC DOMESTIC DEBT AND PRIVATE INVESTMENT: A CASE STUDY OF KENYA

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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Abstract

This study seeks to determine the impact of long-term public domestic debt on private investment in Kenya over the period 2000 to 2012 using quarterly data. Of particular interest, is whether long-term public domestic debt has a greater impact on private investment than short-term public domestic debt. An investment function with six independent variables-long-term public domestic debt, short-term public domestic debt, external debt, GDP, interest rate and public investment- was estimated by analyzing unit root tests, a co-integration test and a Vector Error Correction Model. The study finds that long-term public domestic debt crowds-out private investment in Kenya, and that its impact is greater than that of short-term domestic debt in the long-run. As such, the findings of this study call for the bolstering of economic reforms aimed at strengthening public debt management such as developing a framework to identify and manage the trade-offs between expected cost and risk in the government debt portfolio. The results have important implications for fiscal management as the government raises finances in order to implement flagship projects aimed at attaining Kenya's blue print for elevating Kenya to middle-income status, the Vision 2030.

Key words: public domestic debt, private investment, crowding- out, Vector Error Correction Model.

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List of Abbreviations

AIC- Akaike Information Criterion

CBK-Central Bank of Kenya

DD-Public domestic debt

GDP-Gross Domestic Product

HIPC-Highly Indebted Poor Countries

KNBS-Kenya National Bureau of Statistics

LIC-Low Income Countries

EM-Emerging Markets

VECM-Vector Error Correction Model

1. INTRODUCTION

1.1 Background

1.1.1 Domestic Debt

The Government Finance Statistics Manual (GFSM) prepared by the International Monetary Fund (2001) defines debt as "all liabilities that require payments of interest and/or principal by the debtor to the creditor at a date or dates in the future" (p. 129). Further, long-term (short-term) debt refers to debt with an original maturity of more (less) than one year at the date of issuance (Bua, Pradellib, & Presbiteroc, 2014).

In practice, three criteria are common in defining domestic debt: (1) on a creditor residency basis, debt is domestic if owed to residents. This criterion is widely used in the compilation of statistical information on government debt by official agencies following the GFSM and is relevant to study international risk sharing and resource transfers between residents and non-residents; (2) on a currency basis, debt is domestic if denominated in local currency. This definition enables the analysis of currency mismatch and vulnerabilities associated with the currency composition of the public debt portfolio; (3) finally, on a jurisdiction basis, debt is domestic if issued in local financial markets and subjected to the jurisdiction of a local court. This definition helps recognizing the implications of debt restructuring procedures (International Monetary Fund, 2001). The currency basis is used to define domestic debt in this study because Kenya's debt recording practices and data constrains on public domestic debt warrant it.

Developing countries are often confronted with no other option but to take either domestic or foreign loans to enable the financing of developmental projects (E.Uma, Eboh, & Obidike, 2013). This is because at early stages of development, countries have small stocks of capital and limited investment opportunities. Such borrowing is therefore necessary to finance public expenditure in order to increase social welfare and promote economic growth. However, a reasonable level of borrowing is what is likely to enhance economic growth, through capital accumulation and productivity growth (Chowdhury, 2004).

Also noteworthy, is that Public Domestic Debt (DD) in Low Income Countries (LICs) and Emerging Markets (EM) remains a controversial issue in academic and policy making circles. The question is more pertinent than ever, given the increased scope for expanding DD in many LICs and EMs, following external debt reduction initiatives and a surge in international portfolio interest in local currency bonds (Abbas & Christensen, 2007). Indeed, in a study of *Domestic public debt in Low-Income Countries: Trends and structure*, it was found that the main stylized fact emerging from the data was an increase in domestic government debt since 1996 and that public debt management in EMs also increased reliance on local financial markets since the early 2000s (Bua et. al., 2014).

1.1.2 Private Investment

On the side of investment, private investment refers to the accumulation overtime by firms of real capital goods; that is, goods that are expected to yield a future flow of services (Levacic & Rebmann, 1982). Economic growth and development depend essentially on a country's ability to invest and make efficient and productive use of its resources. In this regard, the role of the private sector is important both in terms of its contribution to the quantity of Gross Domestic Income (GDI) and its ability to employ and allocate resources efficiently. Private investment, as a proxy for a dynamic private sector, has not only been seen as an engine for job and income creation, but it also has a role to play in the provision of both infrastructure and social services (Bayraktar, 2003).

A critical challenge (concerning investment) is to ensure the necessary internal conditions for mobilizing enough domestic savings to sustain adequate levels of investment in productive and human capacities. This responsibility includes creating the conditions that make it possible to secure the needed financial resources which include macroeconomic and microeconomic policies, public finance, the condition of the financial system and other basic elements of a country's economic environment (Bayraktar, 2003).

1.1.3 Crowding-Out Effect

Bua et al. (2014) state that an evaluation of fiscal deficit financing on a cost-benefit analysis shows that domestic borrowing, typically denominated in local currency, does not bring about some complications associated with external credit flows e.g. exposure of the public debt portfolio to unanticipated movements in the exchange rate. The most prominent concern, is the crowding out effect: by issuing domestic debt the governments taps private savings that would otherwise be available to finance private investment (Bua et al., 2014). If market-determined interest rates increase, this may reduce investment demand.

There is asymmetric information in a financial contract when a borrower has information that the lender ignores or does not have access to (Bebczuk, 2003). In financial markets, information asymmetry can either take the form of adverse selection or moral hazard. A lender suffers adverse selection when he is unable to distinguish between projects with different credit risk when allocating credit. Those undertaking risky activities find it convenient to hide the true nature of a project thereby exploiting the lender's lack of information.

In moral hazard, the borrower can apply funds to different uses than those agreed upon with the lender, who is limited by his lack of information and control over the borrower (Bebczuk, 2003). If interest rates are controlled or lenders are reluctant to raise them to avoid adverse selection and moral hazard problems, the domestic government borrowing can lead to credit rationing and a reduced supply of funds for private investment (Bua et al., 2014).

Additionally, the banking system, which often dominates the government debt market in LICs, generally has a strong incentive for buying T-bills, given that such instruments provide a regular flow of earnings and have a privileged treatment (e.g., a zero credit risk) in the calculation of risk-based capital adequacy requirements (Diouf & Boutin-Dufresne, 2012). This may lead to relatively weaker incentives to extend credit to riskier private borrowers and even lower efficiency in banking operations and financial intermediation (Hauner, 2006).

As such, larger crowding-out effects are to be expected when the investor base is strongly biased toward commercial banks (Christensen, 2005) since interest rates tend to be higher if the investor base for domestic debt is relatively narrow, as the government may be held hostage by a particular group of investors (World Bank and International Monetary Fund, 2001).

1.1.4 Short-Term Versus Long-Term Public Domestic Debt

The government debt portfolio should adequately comprise short- and long-term paper (Christensen, 2005). To support this statement, Christensen (2005) discusses the risks involved with the different debt maturity instruments. On one hand, short-term debt is susceptible to frequent rollovers which make the government highly vulnerable to a sudden increase in interest rates, which can raise debt service significantly. The sudden rise in interest rates can lead to further deterioration in the market's confidence in government bonds, prompting even higher interest rates on government debt. On the other hand, administrative costs tend to be higher with a short maturity structure, because the government must frequently roll over large parts of its debt, notably in countries without an automated book-entry system (Christensen, 2005).

According to Gelbard and Leite (1999), government debt is the only investment opportunity besides lending to the private sector in many African countries since stock markets are either absent or highly illiquid. The provision of government longer-term paper is therefore highly important for investors to balance their long-term liabilities with long-term assets and for banks to increase profitability by taking on interest rate risk (Christensen, 2005).

At the same time, Christensen (2005) points out several obstacles that the government may experience in pursuing a longer-term debt portfolio: (1) the market may not be willing to hold long-term paper in view of significant inflation and default risks; (2) the market may not be sufficiently advanced to demand long-term paper, especially in the absence of institutional investors (Impavido, Musalem, & Tressel, 2003); (3) the government may hesitate to extend the maturity since longer-term bonds can entail higher interest rates, in view of a rising yield curve, which would increase financing costs.

1.2 Problem Statement

Past literature on government borrowing underscore limitations on the number of studies concerning domestic public debt in LICs and EMs. According to Bua et al. (2014), empirical work on public debt management in LICs has been constrained by the lack of a comprehensive domestic public debt database and by the traditional emphasis placed on foreign debt as the main way to finance fiscal deficits in low income countries. Barro (1974) also points out that most of the vast literature on the effects of public debt on capital accumulation and growth has been derived in the context of industrialized countries. This, coupled with the lack of comprehensive empirical studies that examine public domestic debt's impact on savings, investment, financial deepening, and hence, growth (Abbas & Christensen, 2007) has constrained a meaningful policy response to the increased public domestic borrowing in LICs and EMs.

In 2008, Maana, Owino and Mutai conducted a study that analyzed the development in public domestic debt in Kenya and its impact on the economy, for the period 1996 to 2007. The authors found a significant increase in domestic debt during the period which resulted in higher domestic interest payments that presented a significant burden to the budget. Due to a considerable level of financial development in the country, however, the study found no evidence that the rise in domestic debt crowds-out private sector lending (Maana, Owino, & Mutai, 2008). Later, Robert King'wara in 2014 conducted a study on the impact of domestic public debt on private investment in Kenya for the period 1967-2007. With regards to DD, the main findings of the study confirmed with statistical significance, that increasing levels of domestic public debt negatively impact private investment through a crowding-out effect (King'wara, 2014).

The results of both studies suggest ambiguous conclusions on the crowding out hypothesis in Kenya. This research aimed to determine conclusively, the relationship between public domestic debt and private investment in Kenya. Of particular interest, was the effect of the debt maturity on private investment.

As such, this research sought to further the studies on the impact of public domestic debt on private investment by splitting DD by sources and taking all of them as explanatory variables in the investment function. By doing so, the relationship between DD maturity on private investment was analyzed.

70% of interest payments in Kenya are for domestic debt, yet the stock of domestic debt is only 49% of the total debt. As such, the Kenyan debt problem has been under discussions in local and international forums (King'wara, 2014). An analysis of the CBK domestic debt by instrument data revealed that the stock of long-term domestic debt (represented by treasury bonds) has increased from 7.1% in 1996 to 67.3% of DD in 2007, as compared to short-term domestic debt (represented by treasury bills) which has declined from 65.2% to 23.3% over the same period (Maana, Owino, & Mutai, 2008).

Yet a lot of developing countries are not able to issue long-term government securities at a reasonable interest rate, which results in maturity mismatch[1] (Panizza, 2008). Given the debt-investment relationship, it was therefore necessary to determine the implications of the increasing long-term public domestic debt on private investment in Kenya.

1.3 Purpose of the Study

Past literature on debt management reveals that many developing countries are unable to issue long-term government securities at a reasonable cost. This makes them more vulnerable to rollover and interest rate risks, which increase the likelihood of a crowding-out effect. Given that Kenya has experienced a growth in long-term domestic debt since the mid-nineties, this study aimed at assessing the impact of the maturity of public domestic debt on private investment. Specifically, it sought to determine whether long-term public domestic debt in Kenya has a greater impact on private investment than short-term public domestic debt.

[1] Refers to the generally longer times to maturity (or terms) of bank (or an institution's) assets relative to their liabilities.

1.4 Research Objectives

1. To determine the impact of long-term public domestic debt on private investment in Kenya.
2. To determine whether long-term public domestic debt has a greater impact on private investment in Kenya than short-term public domestic debt.

1.5 Research Questions

1. What is the impact of long-term public domestic debt on private investment in Kenya?
2. Does long-term public domestic debt have a greater impact on private investment than short-term public domestic debt in Kenya?

1.6 Significance of this Research

The findings of this study should provide deeper insights on the impact of public domestic borrowing on private investment in Kenya, in relation to the debt maturity. Billions of shillings will be required by the government to implement flagship projects such as the Standard Gauge Railway (SGR), laptops for standard one pupils etc. aimed at attaining Kenya's blue print for elevating Kenya to middle-income status, the Vision 2030. The government will incur both internal and external debt to fund such projects. With the increasing level of long-term domestic debt in the country, knowledge on whether long-term domestic public borrowing is followed by a crowding-out effect on investment will be important as it will inform fiscal management decisions of policy makers.

The findings of this research will therefore assist fiscal policy makers, economists, researchers and the general public in better understanding and assessing the tradeoffs that governments in developing countries such as Kenya have to face when choosing how to finance public spending deficits and how these decisions affect the countries' private investment environment.

1.7 Hypotheses of the Study

Hypothesis 1:

Long-term DD has a negative impact on private investment in Kenya.

Hypothesis 2:

Long-term DD has a greater impact on private investment than short-term domestic debt in Kenya.

2. LITERATURE REVIEW

In this chapter, the study delves into the theoretical issues surrounding public domestic debt and private investment, including an empirical review of past studies on the relationship between public domestic debt and private investment in developing countries. The issue of crowding-out is also discussed at length from the point of view of the Classical economists and Keynesian economists. The section concludes by highlighting the relationship between private investment and other variables in the investment model (external debt, GDP, interest rate and public investment).

2.1 Theoretical Issues on Public Debt

King'wara (2014) highlights three main theoretical issues on public debt. First, that excessive domestic debt affects interest rates and interest rate structure. When the government borrows from the domestic market, there emerges a fund crisis (due to excess demand) which raises interest rates. Since the interest rate is an important determinant in investment decisions, high interest rates reduce profit margins and deter investment especially since retained earnings are an important source of finance (King'wara, 2014).

The second impact is through taxation. Debt has to be paid and the economy has to generate the revenues to service debt through taxation. A high debt burden sends signals on the magnitude of government liability and thus the taxation expectations for debt service. In this sense, high taxes are a disincentive to investment (King'wara, 2014).

Lastly, unlike external debt, domestic debt cannot be defaulted since most of it is held by the banking sector, and a default may trigger a banking crisis. As such, increasing domestic debt levels raises default risk in the financial sector players who in turn increase interest rate levels on funds loaned to the private sector (King'wara, 2014).

King'wara (2014) also states that the theoretical framework on the investigation of the impact of domestic public debt upon private investment originates from the different viewpoints held by classical and Keynesian economists. While classical economists take a much conservative stance on public borrowing, the Keynesians are extremely flexible towards the same.

2.1.1 Classical Views on Public Debt

A dominant view of the classical school of thought on debt is that government loan finance withdraws funds from productive private employment. According to King'wara (2014), classical economists suggest keeping public undertakings such as borrowing as minimum as possible. The rationale is that by taking on debt, the public authority amasses resources for its own use leaving private sector with less, a phenomenon popularly termed as crowding-out of private investment (Spencer & Yohe, 1970).

Indeed, classical economists such as Adam Smith, Jean Baptiste Say and David Ricardo disapproved of public debt because they thought that it interfered with the natural order which was conducive to the creation of wealth and increase in the material welfare of the nation (Varughese, 1999). For instance, Adam Smith was of the view that the State was wasteful in that it took borrowed funds for unproductive purposes from private capitalists and deprived them of capital which was badly needed for promoting production of trade (Varughese, 1999).

Another dominant view of the classical school of thought concerning debt is that government borrowing increases the amount of taxes which must be paid to finance the interest on the debt in the future. On this issue, Bastable made a distinction between loan and tax finance. To quote him, he states that "A loan is voluntary and supplied by willing givers; taxation is levied on the willing and unwilling alike. To make things smooth for the present at the cost of the future is not the duty of the wise and farseeing Statesman" (as cited in Varughese, 1999). This was to imply that Bastable disapproved public debt because of the disincentive effect caused by taxation.

Varughese (1999) held that Paul Leroy-Beaulieu made one of the clearer expositions of the classical position on public debt. Leroy-Beaulieu stated that public debt is, in and of itself, neither a good nor an evil; the economist criticized the classicists for their failure to see that public expenditure can be productive by stating that: "a loan will be useful or harmful to the society in general depending on if the State preserves and usefully employs the proceeds or wastes or destroys the capital which the rentiers have given up" (Leroy-Beaulieu, 1883), as cited in Buchanan (p. 111).

2.1.2 Keynesian Theory of Public Debt

Powerfully influenced by the Keynesian Revolution, the scientific basis for the modern theory of public debt was provided by the· *General Theory* in 1936 (Varughese, 1999). The new theory was based on Functional Finance which holds that "the absolute size of the national debt does not matter at all; however large the interest payments that have to be made, these do not constitute any burden upon society as a whole" (Lerner, 1943a). (P. 475).

This 'no burden' doctrine treats the economy as a unit. In it, Lerner likens a nation owing money to other nations to be as impoverished as a man who owes money to other men. He adds that the case does not hold for national debt owed by the nation to citizens of the same nation, as there is no external creditor. To quote him: "We owe it (the debt) to ourselves" (Lerner, The Burden of the National Debt, n.d.). (p. 17). The society in this analysis is regarded as being analogous to a family; it ignores the distinction between economic order based on private enterprise and a command economy (Varughese, 1999).

Varughese (1999) highlights various advantages of public borrowing that the 'no burden' thesis relies on: Through debt creation, the government can tap savings streams, put the resources thus raised to productive use, and bring about an increase in national income. The increased flow of income in turn facilitates the payment of taxes to service the debt. Government borrowing also helps curb consumption, encourages savings, promotes capital formation and makes it possible for the people of a country to improve their standard of living.

From the foregoing, Keynesians approve public borrowing in case of necessity. Their argument is based on the principle of the multiplier which explains how a change in the public expenditure generates a greater change in output (Varughese, 1999).

2.1.3 Neo-classical Investment Theory

Also known as the "accelerator effect," this theory holds that private investment is influenced by the growth rate of real Gross Domestic Product (GDP) and the user cost of capital (Jorgensen 2002). The neo-classical theory suggests that since high interest rates discourage investment by raising user cost of capital, private investment is negatively related to interest rate (King'wara, 2014).

However, according to the Mckinnon-Shaw thesis, interest rates can have a negative effect on investment through the saving channel (King'wara, 2014). The McKinnon-Shaw thesis holds that a low or negative real rate of interest discourages savings and hence reduces the availability of loanable funds, constrains investment, and in turn lowers the rate of economic growth (Bouzid, 2012).

2.2 The 'Crowding- out' Debate

There are several levels at which crowding out has been alleged to occur, according to Blinder and Slow (1973). The first is the view that when the government engages in productive activities which could be provided by the private sector, public spending simply supplants private investment. At the second level of crowding out, when the government indulges in deficit financing, not by issuing money but by floating debt issues, the latter compete with private debt instruments in financial markets. This results in an upward pressure on the rates of interest which will reduce any private expenditure that is interest-elastic (Varughese, 1999).

Buiter (1986) made a distinction between 'Keynesian crowding out' and 'Classical crowding out' and also between short-run' and long-run crowding out (Varughese, 1999). In the short run, it is assumed that changes in outstanding stocks of domestic capital, government debt, high powered money etc. brought about by the flows (investment, government borrowing etc.) over the period under consideration are very small relative to the stocks and can be ignored. Expectations (of future interest rates, exchange rates etc.) are also taken as given (Varughese, 1999).

King'wara (2014) also points out that Keynesian economists are aware of the crowding-out effects of public borrowing. Indeed, Keynes (1936) hinted at such effects in *The General Theory* by mentioning the multiplier limitation brought about by adverse reactions on private investment, "confused" business psychology, and the tendency of the marginal propensity to consume to decline with rises in employment (p. 91).

R. F. Kahn (1931) as cited in Keynes (1936) stated that the change in the amount of employment is a function of the net change in the amount of investment in what is known as the employment multiplier. The marginal propensity to consume on the other hand, measures the change in consumption against the change in income (Keynes, 1936).

According to Keynes (1936), where there is an increase in employment and an associated rise in prices, the method of financing the policy may cause interest rates to increase hence retarding investment in other directions, unless the monetary authority takes steps to the contrary; moreover, the increased cost of capital goods will reduce their marginal efficiency to the private investor, which will require an actual fall in the rate of interest to offset it.

The psychological theory (of the business cycle) is part of Keynesian economics (The Great Soveit Encyclopedia, 1979). According to the psychological theory, during boom periods, exaggerated expectations win out over sound calculations. By contrast, under the conditions of an economic crisis, entrepreneurs lose faith in the possibility for the intensive expansion of production. The course of the capitalist business cycle is therefore influenced by a number of psychological determinants—in particular, the basic psychological law that brings about a decline in the marginal propensity to consume, as well as subjective factors associated with the preference for liquidity that characterizes the owners of monetary capital (The Great Soveit Encyclopedia, 1979).

With regard to business psychology, Keynes (1936) stated that with the confused psychology that often prevails (e.g. where a rise in employment is associated with decreased consumption if there is at the same time, a change in the propensity to consume, perhaps as the result of propaganda during war that supports restricting individual consumption), the government program may raise liquidity-preference or lower the marginal efficiency of capital, through its effect on confidence. This again, may retard other investment unless measures are taken to offset it.

In Buiter's (1986) distinction of Keynesian and Classical crowding out; in the Keynesian 'crowding out', the horizontal shift of the aggregate demand schedule and the composition of that change in terms of changes in investment, consumption or the current account balance, is considered. A tax cut boosts private consumption and crowds out the current account surplus through an appreciation of the nominal and real exchange rate (Varughese, 1999).

On the other hand, classical economists hold that all modes of financing the Government budget namely, taxation, debt financing and money creation crowds out an equal amount of resources available to the private sector, under conditions of full employment. In this view, crowding out effect is not exclusively associated with debt financing (Varughese, 1999).

To conclude, King'wara (2014) asserts that the classicals and Keynesians treat the crowding-out effect quite differently. On one hand, the Keynesians consider the issue of ensuring the smooth and optimum performance of the borrowing activities of government. The classicals, by contrast, raise the issue against undertaking any extent of public borrowing.

From the foregoing, the 'crowding-out debate' brings to light the opposing viewpoints of classicalists and Keynesian economists on whether or not the government should take on debt to finance budgetary deficits. On the one hand, public debt is discouraged as it is thought to limit funding available to the public sector, especially where a large amount of funds is borrowed but is put into unproductive uses. On the other hand, public borrowing is encouraged where the funds are put projects that boost the performance of the economy, thereby improving productive capacity of the private sector through a multiplier effect. In the context of this study, the question becomes whether or not long-term public domestic borrowing has improved the productive capacity of the private sector in Kenya and if not, the measures that can be taken to ensure a crowding-in effect.

2.3 An Empirical Review of the Relationship between Public Domestic Debt and Private Investment

In the study *Domestic Debt Markets in Sub-Saharan Africa,* Christensen (2005) analyzed the role of domestic debt markets in 27 Sub-Saharan African (SSA) countries (including Kenya), based on data running from the period 1980–2000. The study also sought to determine if domestic borrowing crowded out private sector lending in the period.

The author found that domestic debt markets in SSA were generally small, highly short term, and had a narrow investor base. With regard to the maturity structure of domestic debt in SSA, Christensen (2005) cautioned that the dominance of short-term paper in the African securities markets greatly increased rollover and market risk, especially in countries with large outstanding debt stocks.

To examine the effect of domestic debt borrowing on private investment, Christensen (2005) used a panel data model in which private sector lending was regressed on domestic debt for the 27 countries over the period 1980-2000 (both variables were in percentage of extended broad money[2]). The results from this regression showed that an expansion in domestic debt of 1% relative to extended broad money caused the ratio of private sector lending to extended broad money to decline by 0.15%, which supported the crowding-out hypothesis.

In 2008, Maana et. al. conducted a study on domestic debt and its impact on the economy in Kenya. The aim of the study was to analyze the development in public domestic debt and its impact on the economy, for the period 1996 to 2007. The authors found that the composition of the country's public debt had shifted in favor of domestic debt. Additionally, considerable progress had been made in extending the maturity profile of the debt and diversification of the investor base in favor of institutional investors and individuals.

To determine the impact of domestic debt on credit to the private sector, Maana et. al. (2008) used a model similar to that of Christensen (2005) in which private sector lending was regressed on domestic debt, with both variables having been expressed as a percentage of extended broad money. In this model, monthly data covering the period 1996 to 2007 was used. The results from the regression yielded significant evidence against the crowding-out hypothesis at 5% significance level, as it emerged that an expansion in domestic debt of 1% to extended broad money caused the ratio of private sector lending to extended broad money to increase by 0.16%.

The author attributed these findings to increased participation by non-bank investors in the government debt market during the period under study, which in turn reduced the commercials banks' holdings of domestic debt. Additionally, the amount of new borrowing was not large enough to have an adverse impact on the growth in credit to private sector, as interest rates remained stable especially between 2002- 2007.

[2]A money aggregate that consists of M2 (M1 + time and savings deposits + certificates of deposits + deposit Liabilities of Non-Bank Financial Institutions) + residents' foreign currency deposits.

Maana et. al. (2008) concluded that Christensen's (2005) finding that domestic debt crowded out private sector lending in Kenya for the period 1980- 2000 may not apply for the period after 2000. This is because the country engaged in a number of financial sector and debt management reforms that reversed the composition of domestic debt in favor treasury bonds. An example of such a reform is the government initiative to restructure public domestic debt and develop the domestic debt markets which was undertaken in May 2001.

Most recently, King'wara (2014) conducted a study on the impact of domestic public debt on private investment in Kenya over the period 1967-2007. In the study, the author estimated an investment function with four independent variables, namely: public domestic debt, GDP, interest rate and public investment, by analyzing the unit root test[3] and co-integration test[4]. With regards to DD, the main findings of the study confirmed with statistical significance, that increasing levels of domestic public debt negatively impact private investment through a crowding-out effect- a 1% increase in domestic debt was found to lead to a 0.17% decrease in private investment.

The author attributed these results to increased liberalization of interest rates since 1991, prior to which Kenya had a controlled interest rate regime. According to King'wara (2014), the increased liberalization of interest rates has caused an increase in interest rates which has resulted in a crowding out effect on private investment.

2.4 Research Gap

From the foregoing, it is unclear as to whether empirical studies of the impact of DD on private investment support the crowding-out hypothesis in Kenya. Herein lies the research gap. On the one hand, financial deepening, through a diversified investor base is thought to have prevented crowding out of private investment despite increase DD in Kenya since the mid-nineties. On the other hand, interest rate liberalization since 1991 is thought to have brought about a crowding out effect on private investment. It is against this back drop, that this study finds its relevance.

[3]In statistics, a unit root test examines whether a time series variable is non-stationary using an autoregressive model.

[4] A procedure that tests whether there exists a stationary linear combination of nonstationary random variables.

Despite the fact that worldwide, public borrowing is one of the major economic policy issues faced by the governments of poor countries historically, domestic debt has not received as much attention as external debt (Maana et. al., 2008). Additionally, past Kenyan-specific private investment studies have not attempted to investigate the impact of DD on private investment (King'wara, 2014). With the debt restructuring since 2001 that has resulted in a greater holding of long-term government borrowing, the proposed study focuses on filling this gap in knowledge by empirically assessing the impact of long-term DD on private investment.

This study therefore sought to fill this gap in knowledge by going beyond answering the question of whether or not public domestic borrowing crowds out private investment in the country. It went further to split the domestic debt by its constituents based on maturity in order to better assess what aspect of DD has a greater impact on private investment. Of particular interest, was whether long-term DD has a greater impact on private investment than short-term DD, especially since past studies have shown that developing countries are unable to issue long-term DD at a reasonable interest rate which has caused maturity mismatch (Panizza, 2008). Such an assessment is deemed important as it will help fiscal managers in developing a clearer framework for public debt management.

2.5 Relationship between Other Variables and Private Investment

According to Matin and Wasow (1992), empirical studies on the determinants of private investment in developing countries have been few and far between. The results of such studies have suggested that the important determinants of private investment in developing countries are: expected aggregate demand (usually proxied by output), domestic credit constraint (usually proxied by credit availability to private sector), and physical infrastructure-usually proxied by public investment expenditure (Sundararajan & Thakur 1980, TunWai & Wong 1982, Blejer & Khan 1984, Chhibber &Van Wijnbergen 1988, Shafik 1990, Schmidt-Hebbel and Muller 1991). External debt is also seen to be an important determinant of private investment in developing countries (Claessens & Diwan, 1990).

Public investment refers to infrastructural outlays by the government which can have a productive life for several decades (United Nations, 2009). Despite the well-accepted proposition that private and public investment are related in developing countries (Wai & Wong, 1982), there is much uncertainty as to whether on balance, public sector investment raises or lowers private investment (Blejer & Khan, 1984).

Generally speaking, public sector investment can cause crowding out if it utilizes scarce physical and financial resources that would otherwise be available to the private sector; further, financing of public sector investment-whether through taxes or debt issuance lowers the resources available to the private sector, hence depressing private investment activities (Blejer & Khan, 1984). Yet at the same time, King'wara (2014) points to the growing acknowledgement that public investment in infrastructure is more likely to compliment private investment since it raises the productivity of private capital.

Interest rate refers to a percentage of principal paid a certain number of times per period, for all periods during the total term of the loan or credit (Homer & Sylla, 1996). Lugo (2003) holds that investigating the role of interest rates on private investment is an important issue for developing countries since the economic authorities generally believe that real interest rates play a vital role in investment issues. In what is known as the neoclassical approach, Jorgenson (1963) states that the desired stock of capital is directly related to output and inversely related to the cost of capital. A fall in the real interest rate reduces the opportunity cost of capital hence increasing the desired stock of capital and investment spending.

Literature by McKinnon (1973), Shaw (1973), and Fry (1988) however, suggest that an increase in real interest rates has a positive effect on the volume and on the quality of investment in financially repressed economies[5]. The positive effect on volume is seen because self-finance is important and investment is lumpy. Consequently, economic agents accumulate resources before implementing any project.

[5]Financial repression refers to high intervention by the government in financial markets by setting ceilings on nominal interest rates, imposing high legal reserve ratios, and direct intervention on credit allocation.

A rise in real interest rates thus stimulates both total and financial savings and investment, as a result (Lugo, 2003). On the other hand, higher interest rates rule out investment projects with low productivity; and move resources from less efficient e.g. goods facing depreciation, to more efficient forms of accumulation e.g. bank deposits with a more favorable return. This causes the positive effect on the quality of investment (Lugo, 2003).

External debt (or foreign debt) refers to the total debt a country owes to foreign creditors (The World Bank and International Monetary Fund, 2001). Past studies point to a negative relationship between external debt and private investment in Highly Indebted Poor Countries[6] (HIPC). For instance, Eduardo Borensztien (1990) classifies the effect of foreign debt on investment into two- "debt overhang" and "credit rationing" effect. Borensztien defines debt overhang as a condition in which the debtor country fails to service its external debt obligation fully with the existing resources, and undertakes a negotiation with creditors to determine actual debt payment, but based on the prevailing economic conditions of the debtor country.

For Borensztien (1990), debt overhang creates an adverse effect on private investment since an increase in output will be used to pay the forthcoming debt for a country experiencing debt overhang. This therefore creates a disincentive on private investment and poses a hindrance on the government to pursue the right policies. Under the credit rationing effect, external debt adversely affects investment since a country may miss out on a loan because of their inability or willingness to pay their existing debt.

Claessens and Diwan (1990) also acknowledge that external debt may crowd out both public and private investment since debt servicing[7] might take away the limited resources of poor countries that could have been used on investment and channels them towards meeting their debt obligations. Further, Apere (2014) holds that Ajiya (1997) points out that HIPC may have to raise their taxes in order to service their debt, which acts as a disincentive for investments.

[6]A group of developing countries with high levels of poverty and debt overhang which are eligible for special assistance from the International Monetary Fund and the World Bank.
[7]The act of retiring debt by making interest and principal payments to creditors.

GDP refers to the monetary value of all the finished goods and services produced within a country's borders in a specific time period (Coyle, 2014). Regarding the relationship between GDP and private investment, Lugo (2003) states that a change in output has been considered a determinant of investment spending dating from early studies such as that of Clark (1917). This relationship is what is known as the "accelerator effect." Further, most empirical studies point to a strong and positive effect of changes in GDP on private investment or GDP growth on the investment-GDP ratio (Lugo, 2003).

2.6 Conceptual framework

This study focused on the relationship between public domestic debt (independent variable) and private investment (dependent variable). In particular, the study sought to determine the impact that long-term DD has on private investment, and whether this impact is greater than that caused by short-term DD. As such, public domestic debt was split into short-term and long-term public domestic debt. A primary concern with public domestic debt is that it could reduce private investment in a country, as held by the crowding-out hypothesis. The crowding-out hypothesis therefore suggests a negative relationship exists between public debt and private investment.

Long-term DD was represented by treasury bonds (T-bonds) while short-term DD was represented by Treasury bills (T-bills) in the investment function. Other constituents of DD in Kenya such as government stocks and advances from commercial banks were not included in the investment model as they contribute a negligible amount to the total DD under the period of study.

Other independent variables such as external debt, real GDP, real public investment and real interest rate were also included in the investment function, as per the neoclassical flexible accelerator model. Past studies have shown that there exists a negative relationship between external debt and private investment in HIPC. On the other hand, the accelerator theory suggests that the coefficient of GDP is expected to assume a positive sign, but that of public investment could be either positive or negative depending on e.g. whether or not the government makes public investment on infrastructure.

The relationship between interest rate and private investment has also been found to be uncertain. The neoclassical theory suggests an inverse relationship due to perceived higher opportunity costs when interest rates rise. At the same time, past studies point to a direct relationship for financially repressed economies.

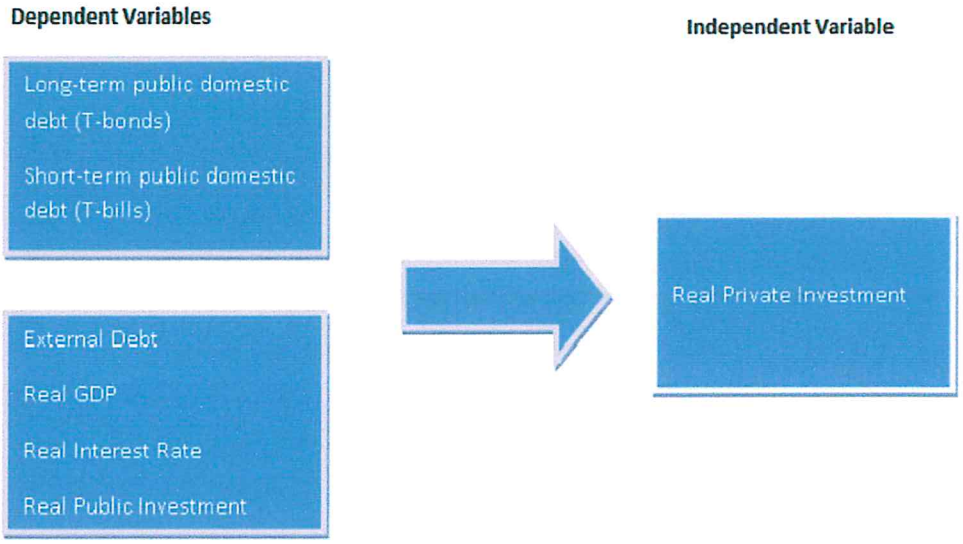

Figure 1: Conceptualized investment model variables

3. METHODOLOGY

In this section, the techniques and procedures followed in carrying out the empirical analysis of the relationship between public domestic debt and private investment are discussed. The section also highlights the data sources for the study, the scope of the study and gives the model specification. The section concludes by breaking down the time series analysis which included unit root tests, a cointegration test, causality testing and a Vector Error Correction Model.

3.1 Research Design

This study was exploratory in nature as it sought to determine the impact of long-term public domestic debt on the private investment. The neoclassical investment model has been applied in the past by authors such as Lugo (2003) and King'wara (2014), in investigating the relationship between investment and other variables. As previously mentioned, this model implies that a fall in the rate of interest will be followed by an increase in gross capital purchases. According to Antonakis (n.d.), the neoclassical theory of optimal accumulation of capital provides a highly satisfactory explanation of actual investment expenditure for a given sample period. As such, the neoclassical approach was used for the investment function in this study.

The King'wara (2014) version of the neoclassical flexible accelerator model in particular, was applied in this study. This is because recent empirical studies for developing countries e.g. Fielding (1997) have found evidence supporting the need to make important alterations to the investment equation owing to economic reform (Lugo, 2003). The King'wara (2014) version of the neoclassical flexible accelerator model was therefore fitting for this study, as the author took into account various constraints faced by private investors in developing countries in its application.

The external debt variable, not found in King'wara's version of the neoclassical accelerator model was also added to the model because as at June 2014, external debt accounted for 47% of total debt in the country (The National Treasury, 2014). This makes it an important variable in explaining changes in private investment levels in Kenya.

Finally, the King'wara (2014) investment model was further extended by decomposing DD into its constituent elements. This was done in line with the objectives of this study of determining the relationship between long-term domestic debt and private investment, and what aspect of DD maturity has a greater impact on private investment.

3.2 Data Collection and Scope of the Study

The study used data collected from secondary sources. The data used was also time series in nature as it comprised of observations of variables over time. For uniformity purposes, quarterly figures covering the period 2000-2012 were used in the estimations due to the limitation of limited annual data on gross investment.

Regarding the sources of the data, figures on public borrowing were obtained from the CBK website. GDP data was obtained from the Kenya National Bureau of Statistics (KNBS) quarterly GDP reports. The CBK *Monthly Economic Review* Reports and Statistical Bulletins were used to obtain figures on real interest rate. Figures on private and public investment were obtained from the KNBS economic surveys.

As has been mentioned, the study faced the limitation of some missing figures on both private and public investment annual data, which called for the interpolation of these data points. The data was interpolated by running a Gandolfo algorithm on Eviews. This method was selected as it allows for the conversion of annual data to quarterly data (Gandolfo, 1980).

3.3 Data Analysis

3.3.1 The Variables and the Investment Model

The variables used in the investment function for this study were: real private investment, long-term public domestic debt, short-term public domestic debt, external debt, real GDP, real public investment and real interest rate. The variables were selected based on the neoclassical investment accelerator model.

The natural logs of the variables were used for the estimation of the investment model which was expressed as:

Equation 1

$$lnRPRINV_t = \alpha_0 + \alpha_1 lnLTDD_t + \alpha_2 lnSTDD_t + \alpha_3 lnED_t + \alpha_4 lnRGDP_t + \alpha_5 lnRINT_t + \alpha_6 lnRPUBINV_t + \mathcal{E}_t$$

Where:

lnRPRINV: Logarithm of real private investment

lnLTDD: Logarithm of long-term public domestic debt

lnSTDD: Logarithm of short-term public domestic debt

lnED: Logarithm of external debt

lnRGDP: Logarithm of real GDP

lnRINT: Logarithm of real interest rate

lnRPUBINV: Logarithm of real public investment

α_0: Intercept

$\alpha_1 - \alpha_6$: Parameters

$\mathcal{E}$: Error term

The natural logs of the variables were used for estimation, just as in past studies on the determinants of private investment such as Ouattara (2004), and Servatu and Jayaraman (2001). In statistics, the use of logs simply reduces the magnitude of data in relation to other variables data, for easier analysis. The properties of the model will not be lost.

3.3.2 Empirical Analysis

The entire process of estimation in the study was ran by the ninth version of the package Econometric Views (Eviews 9). The time series properties of the variables and their co-integration characteristics were tested before the estimation of Equation 1 to avoid getting spurious results. The analysis also entailed a Granger causality test and Vector Error Correction Model (VECM).

3.3.2.1 Unit Root Testing

When non-stationary data is used in estimation, it produces unreliable t-statistics of the estimated coefficients which have theoretically infinite variances which leads to spurious results. The study therefore made use of the Augmented Dickey Fuller (ADF) test (Dickey & Fuller, 1979) and Phillips-Perron (PP) test (Phillips & Perron, 1988) to test for the (non)stationary properties of the time series.

The basic objective of the unit root test is to determine the null hypothesis that Ø= 1 against the one sided alternative Ø <1, in:

Equation 2

$$Y_t = \emptyset Y_{t-1} + \mu_t$$

where Y_t is the variable of interest, $\emptyset$ is the coefficient used to test for stationarity, Y_{t-1} is the lagged value of Y_t and μ_t is an error term.

Thus, the hypotheses of interest are:

H_0: Series contains a unit root

H_1: Series is stationary

The absence of a unit root indicates that the data is stationary, which is a desirable property for time series data (Gujarati, 2003).

The ADF test is estimated by the following regression;

Equation 3

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \cdots + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t$$

where ε_t is a pure white noise error term and where $\Delta Y_{t-2} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. The number of lagged difference terms to include is often determined empirically, with the idea being to include enough terms so that the error term in equation 3 is serially uncorrelated, so an unbiased estimate of δ, the coefficient of lagged Y_{t-1}, can be obtained (Gujarati, 2003). If δ=0, then the time series is nonstationary.

The ADF test possesses the shortcoming of involving extra differenced terms in the testing equation. This reduces the power of the testing procedure due to the resulting loss of degrees of freedom. The PP test on the other hand, suffers from severe distortions where autocorrelations of the error term are primarily negative, with the actual size being much greater than the nominal size (Campbell & Perron, 1991).The rationale behind applying both tests therefore, was to overcome any deficiencies inherent to either test.

3.3.2.2 Cointegration Testing

A co-integration test was conducted when all variables in the model were found to be nonstationary at constant and no trend, in order to determine their long-run relationships. The no trend option had been applied when testing for (non)stationarity since a graphical representation of all the variables revealed that the time series was neither upward-trending nor downward-trending.

For a Johansen cointegration test to be conducted, variables must be nonstationary at level and stationary upon differencing. The variables in this model conformed to these requirements (see chapter on results and discussion). The Johansen approach was also used in this study as opposed to the Engle-Granger (Engle & Granger, 1987) two-step procedure because it is considered to be superior to the latter test. This is because the former test is applicable in a multivariate case which could be linked to more than one co-integrating vector (King'wara, 2014).

According to the Johansen cointegration test, if Y_t is a vector of n stochastic variables, then there exists a k-lag vector auto regression with Gaussian errors [8]of the following form:

Equation 4

$$\Delta Y_t = \alpha + \Gamma_1 \Delta Y_{t-1} + \cdots + \Gamma_{k1} \Delta Y_{t-k} + \Pi Y_{t-1} + Z_t$$

Where Γ_1..... Γ_{k-1} and Π are co-efficient matrices, Z_t is a vector of white noise process and α contains all deterministic elements. According to Gujarati (2003), the focal point of conducting Johansen's cointegration test is to determine the rank[9] (r) of a p x p matrix, A.

[8] Errors that follow a normal distribution.

[9] The rank of a matrix is the number of linearly independent rows or columns that it has.

There are three possible ranks in the application. The first is a full rank, which implies that the variables in the model under investigation are given by a stationary process. The rank of matrix A could also be zero would indicate that the variables in the model under investigation have no long- run relationship. The last rank is a case where $0 < r < p$, which is a reduced rank. The reduced rank expresses that there are r cointegrating relations among the elements of Y_t and (p-r) common stochastic trends.

The number of lags used in the vector autoregression can be chosen on the evidence provided by Akaike's Information Criterion (Gujarati, 2003).

The Johansen approach was used to determine the number of co-integrating vectors, provide the estimates of these vectors, as well as the estimates of the adjustment parameters in the model.

3.3.3.3 Causality Testing

Prior to running the Vector Error Correction Model (VECM), a Granger causality test was conducted to determine if long-term DD and short-term DD have the ability to predict future values of private investment, which had been the underlying assumption all along. This method of causality analysis was selected for the study because of its computational simplicity. The lag selection criteria for this test was based on the Akaike Information Criterion (AIC) as it balances a good fit for the model with parsimony, and at the same time incorporates a weak penalty term for including additional parameters (Brooks, 2014).

For this study, the test involved estimating the following pairs of equations:

Equation 5

$$lnRPRINV_t = \sum_{i=1}^{n} \alpha_i \, lnDD_{t-i} + \sum_{j=1}^{n} \beta_j \; lnRPRINV_{t-j} + u_{1t}$$

Equation 6

$$lnDD_t = \sum_{i=1}^{n} \lambda_i \, lnRPRINV_{t-i} + \sum_{j=1}^{n} \delta_j \; lnDD_{t-j} + u_{2t}$$

where it is assumed that the disturbances, u_{1t} and u_{2t} are uncorrelated.

Equation 5 tests whether the future value of private investment is determined by its own past values and the past values of public domestic debt (long-term or short-term) while equation 6 tests the vice versa. α_i, β_j, λ_i and δ_j are simply the coefficients of the lagged variables in either equation.

3.3.3.4 Vector Error Correction Model

Upon the completion of stationarity, cointegration and causality testing, a Vector Error Correction Model was applied in order to determine the speed of adjustment[10] that the variables follow towards the long-run equilibrium path, in response to any divergence that may have taken place in the short-run. For a VECM to be conducted, the variables must be cointegrated. The evidence of cointegration in the model (see chapter on results and discussion) warranted a VECM for the investment model in this study.

The VECM relationship was represented by equation 7 below:

Equation 7

$$\Delta Y_t = \Pi Y_{t-k} + \Gamma_1 \Delta Y_{t-1} + \cdots + \Gamma_k \Delta Y_{t-(k-1)} + u_t$$

where $\Pi = \left(\sum_{i=1}^{k} \beta_i\right) - I_g$ and $\Gamma_i = \left(\sum_{j=1}^{i} \beta_j\right) - I_g$. g denotes the number of variables in the model which in this case is equal to 7 (lnRPRINV, lnLTDD, lnSTDD, lnED, lnRGDP, lnRINT and lnRPUBINV). k represents the number of lags, each with a Γ coefficient matrix attached to them. Π represents the long-run coefficient matrix, while u_t represents an error term. I_g represents the identity matrix[11] of the variable g.

[10]Speed at which a dependent variable-Y returns to equilibrium after a change in an independent variable-X.

[11] A square matrix in which all the elements of the principal diagonal are ones and all other elements are zeros.

4. RESULTS AND DISCUSSION

The findings of the study and their implications are discussed in this section.

4.1 Unit Root Results

Two unit root tests have been used, that is, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The critical values for the ADF and PP tests at level and no trend have been summarized as:

i. 1% critical value: -3.565
ii. 5% critical value: -2.919
iii. 10% critical value: -2.557

The t-statistics of both stationarity tests have been summarized in table 1 below:

Table 1: Unit Root Test Results

Variable	Test Statistic at Level		Test Statistic at First/Second Difference		Level of Integration
	ADF	PP	ADF	PP	
LNRPRIVINV	-2.170798	-1.630290	4.391270	5.398602	I(1)
LNLTDD	-2.456891	-2.155009	-3.383994	-3.268474	I(1)
LNSTDD	1.206174	-0.497075	-3.217534	-7.068453	I(1)
LNED	1.881649	1.977529	-6.136792	-6.106180	I(1)
LNRGDP	0.325147	0.454712	-7.270204	-3.268474	I(1)
LNRINT	-2.475775	-2.750418	-6.951120	-6.951152	I(1)
LNRPUBINV	-1.977139	-1.615575	-1.685871	-4.949600	I(2)

Table 1 shows that all the variables are integrated of order one (I(1)), and become stationary after differencing once except for LNPUBINV which becomes stationary after differencing twice. The decision is clear especially with regard to 5% significance level. The stationarity of LNPUBINV is seen at 10% significance level where the critical value (CV) is -1.612 for the ADF test. For the PP test, the stationarity is seen at 1%, 5% and 10% significance level where the CV at 1% is -3.571.

4.2 Cointegration Results

The co-integration test results obtained using the Johansen test are shown in the tables 2 and 3. The trace test indicates that there are two cointegrating equations at 5% significance level. The max-eigenvalue test on the other hand, indicates that there is one cointegrating equation at the 5% significance level. The trace test results are used to establish the cointegration relationship among the variables in this study because trace test power performance is superior to that of the maximum eigenvalue competitors (Lutkepohl, Saikkonen, & Trenkler, 2000).

The trace test therefore confirms that there is a long run equilibrium relationship between real private investment, long term DD, short term DD, external debt, real GDP, real interest rate, and real public investment.

Table 2: Cointegration results based on Trace test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.849700	171.3441	125.6154	0.0000
At most 1 *	0.701488	108.8051	95.75366	**0.0047**
At most 2	0.512361	68.90993	69.81889	0.0589
At most 3	0.473759	45.20996	47.85613	0.0868
At most 4	0.364173	24.02410	29.79707	0.1994
At most 5	0.239757	9.080726	15.49471	0.3580
At most 6	0.001056	0.034859	3.841466	0.8519

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3: Cointegration results based on Max-eigenvalue test

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.849700	62.53897	46.23142	**0.0005**
At most 1	0.701488	39.89517	40.07757	0.0524
At most 2	0.512361	23.69997	33.87687	0.4776
At most 3	0.473759	21.18586	27.58434	0.2651
At most 4	0.364173	14.94337	21.13162	0.2929
At most 5	0.239757	9.045867	14.26460	0.2823
At most 6	0.001056	0.034859	3.841466	0.8519

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The coefficients for the various variables obtained from the Johansen test have been summarized in table 4 below:

Table 4: Johansen Test Coefficient Results

1 Cointegrating Equation(s):		Log likelihood	686.4247			
Normalized cointegrating coefficients **(standard error in parentheses)**						
LNRPRINV	LNLTDD	LNSTDD	LNED	LNRGDP	LNRINT	LNRPUBINV
1.000000	-0.110278	-0.057928	-0.080037	0.035512	-0.069129	0.087697
	(0.00849)	(0.03928)	(0.04925)	(0.02996)	(0.00641)	(0.02101)

The Johansen co-integration test therefore provided a relationship which may be represented by the equation below:

Equation 8

$$LNRPINV = 3.126943 - 0.110278\ LNLTDD - 0.057928\ \text{LNSTDD} - 0.080037\ \text{LNED} + 0.035512\text{LNRGDP} - 0.069129\text{LNRINT} + 0.087697\ \text{LNRPUBINV}$$

4.3 Long-Run Relationships

Equation 8 gives the long-run relationship between the variables in the investment model. The long-run model results support the study's hypotheses that: (1) long-term DD has a negative impact on private investment in Kenya and (2) long-term DD has a greater impact on private investment than short-term DD in Kenya. From equation 8, it can be seen that both long-term DD and short-term DD have a negative impact on private investment. This conforms to the King'wara (2014) findings that public domestic debt crowds-out private investment in Kenya. By increasing the stock of public domestic debt, the government crowds- out private investment via rising interest rates.

The impact of the long-term DD is however greater than that of short-term DD. A 1% increase in long-term DD leads to a 0.11% decrease in private investment, while a 1% increase in short-term DD leads to a 0.0579% decrease in private investment in the country.

The relationship between external debt and private investment is also found to be negative. A 1% increase in external debt results in a 0.08% decrease in private investment, which supports the crowding-out effect of public debt on private investment.

Turning to the remaining variables, interest rates seem to have a negative impact on private investments in Kenya, under the period of study. This could be attributable to the higher cost of capital associated with high interest rates which in turn discourage investment. The negative relationship between the two variables could also be as a result of the shift from the controlled interest rate regime in Kenya to a liberalized system prior to 1991. The increased liberalization and privatization of the Kenyan economy has resulted in high interest rates which play a significant crowding-out effect.

Regarding GDP, the results show that economic growth induces more private investments. A 1% increase in real GDP leads to a 0.0355% increase in investments in the long-run. As already mentioned, in theory, GDP and investment are said to have a positive relationship in what is known as the "accelerator effect". A growing economy would therefore be expected to boost expectations and investments, as a result.

The results also point to a crowding-in effect on private investment by public investment in Kenya. A 1% percent increase in public investment results in a 0.0877% increase in private investment. This shows that public investment in infrastructure compliments private investment in the country by raising the productivity of private capital.

4.4 Causality Results

The Granger causality test results are reported in table 5 below. The Granger causality test was conducted between private investment and short-term DD and private investment and long-term DD only, as they were the main variables of interest in the model.

Table 5: Granger Causality Test Results

Lags: 10

Null Hypothesis:	Obs	F-Statistic	Prob.
DLNLTDD does not Granger Cause DLNRPRINV	41	1.35496	0.0294
DLNRPRINV does not Granger Cause DLNLTDD		1.24176	0.3248
DLNSTDD does not Granger Cause DLNRPRINV	41	0.86642	0.0568
DLNRPRINV does not Granger Cause DLNSTDD		2.86468	0.0216

10 lags are selected for this test based on the AIC. The results show that long-term DD Granger causes private investment at 5% significance level, while a bicausal relationship is seen between short-term DD and private investment at 10% significance level. This confirms that both long-term DD and short-term DD have the ability to predict future values of private investment, which had been an underlying assumption in this study all along.

4.5 VECM Results

The results from the VECM have been summarized in table 6 below. The short-run relationships of the variables in the investment model, their significance in the long-run and short-run, and the speed of adjustment are obtained from this table.

Table 6: VECM Results

D(LNRPRINV) = C(1)*(**LNRPRINV(-1) - 0.110278405431*LNLTDD(-1) - 0.0579282302885*LNSTDD(-1) - 0.0800369871579*LNED(-1) + 0.035512082993*LNRGDP(-1) - 0.0691287702564*LNRINT(-1) + 0.087697145112*LNRPUBINV(-1) + 3.12694378531**) + C(2) *D(LNRPRINV(-1)) + C(3)*D(LNLTDD(-1)) + C(4)*D(LNSTDD(-1)) + C(5)*D(LNED(-1)) + C(6)*D(LNRGDP(-1)) + C(7)*D(LNRINT(-1)) + C(8) *D(LNRPUBINV(-1)) + C(9)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.388212	0.263635	-1.472536	**0.0255**
C(2)	-0.154214	0.063371	-2.433512	0.0219
C(3)	-0.067035	0.240619	-0.278594	**0.0399**
C(4)	-0.094257	0.243278	-0.387446	**0.0132**
C(5)	-0.106655	0.515939	-0.206720	**0.0279**
C(6)	0.054614	0.193447	0.282320	**0.0193**
C(7)	-0.037431	0.017033	-2.197557	**0.0364**
C(8)	0.046922	0.224962	0.208577	**0.0614**
C(9)	-0.019205	0.029304	-0.655371	0.5176

R-squared	0.469074	Mean dependent var	0.000120
Adjusted R-squared	0.317381	S.D. dependent var	0.122801
S.E. of regression	0.101459	Akaike info criterion	-1.530546
Sum squared resid	0.288231	Schwarz criterion	-1.138702
Log likelihood	37.31511	Hannan-Quinn criter.	-1.392403
F-statistic	3.092259	Durbin-Watson stat	2.019532
Prob(F-statistic)	0.012510		

4.5 Significance of the Variables

Table 6 shows that public domestic debt (both long- term and short- term), external debt, GDP and interest rate are seen to have a statistically significant impact on private investment at 5% confidence level. The impact of public investment on the private investment was also found to be statistically significant but at 10% significance level.

4.6 Speed of Adjustment

The VECM results also show that per quarter, the variables in this model follow a speed of adjustment of 38.82% towards the long-run equilibrium path, in response to any divergences that may have occurred in the short run (see C(1) in table 6).

4.7 Short-Run Relationships

The coefficients C(3)-C(8) in table 6 represent the short-run coefficients of the variables in the investment model. The VECM results show that there is a negative relationship between all forms of debt (short, long and external) and private investment in the country in the short-run: However, the impact of short-run public domestic debt is seen to be greater than that of long-term domestic debt in the short run.

A 1% increase in short-term DD lowers private investment by 0.0943% while a 1% increase in long-term DD lowers private investment by 0.067%. A 1% increase in external debt lowers private investment by 0.107%. The negative coefficients on all forms of debt point to a crowding-out effect on private investment by public debt even in the short-run.

The results also report a negative relationship between interest rates and private investment with a 1% increase in interest rate resulting in a 0.0374% decrease in private investment. This shows that high interest rates discourage private investment in the country even in the short- run, perhaps due to higher costs of capital.

The positive relationship between public investment and private investment, and GDP and private investment is also seen to exist even in the short-run. A 1% increase in public investment results in a 0.047% increase in private investment while a 1% increase in GDP increases private investment by 0.055%. This shows that public investment boosts private productivity in the short run, and that there exists an "accelerator" relationship between GDP and private investment in the short- run.

5. CONCLUSION AND RECOMMENDATIONS

This section summarizes the findings of this study, and ties them to the objectives of the research. Based on the findings, the section also proposes a few recommendations on the management of public domestic debt by the fiscal managers in Kenya. The section concludes by pointing possible areas for further research on the relationship between public domestic debt and private investment in Kenya.

This study was conducted with a view to examining the impact of long-term public domestic debt on private investment in Kenya, and whether this impact is greater than that of short-term domestic debt in the long-run, over the period 2000-2012. To accomplish this task, an extension of the King'wara (2014) version of the neoclassical flexible accelerator model was specified and estimated considering long-term public domestic debt, short-term public domestic debt, external debt, interest rate, GDP and public investment as independent variables.

A long-run relationship was estimated and analyzed by performing ADF and PP unit root tests, a Johansen cointegration test, a Granger causality test and a VECM. The main findings of the study confirmed with statistical significance that increasing levels of long-term public domestic debt crowd-out private investment, and by a greater amount than short-term public domestic debt does. Private investment was also found to be positively affected by GDP and public investment, and negatively affected by public external debt and interest rate respectively.

The issue of debt sustainability especially for developing countries has been under discussions in local and international forums which asserts the importance of this empirical study. A high level of public domestic debt, especially long-term domestic debt has been found to crowd-out private investment in Kenya through increased interest rates that raise the cost of capital investment.

High debt levels also force the government to spend a large proportion of expenditure on interest payments, which reduces spending on infrastructural development that could boost private productivity. Additionally, high domestic debt levels are interpreted by economic participants as a future taxation of income to service the debt which acts as a disincentive to investment and signals macroeconomic uncertainty.

Given that private investment is a booster of economic growth in any economy, the Kenyan government should engage in (or bolster current) economic reforms to strengthen the quality of public debt management, in order to reduce the crowding-out effect that public debt has had on private investment in the country.

Such reforms include modifying debt structure based on current economic outlook, developing a framework to identify and manage the trade-offs between expected cost and risk in the government debt portfolio, and prioritizing negotiations towards lengthening debt maturities and writing-off the external debt where possible.

5.1 Suggestions for Further Research

It would be of economic interest to run a model in which private investment is decomposed into its constituents and then take them each as separate dependent variables, in order to determine which particular aspect of private investment is crowded- out by public domestic debt.

An empirical analysis seeking to answer the question of why short-term public domestic debt crowding-out effects are greater than those of long-term public domestic debt in the short-run and vice versa, may also be another area rich for further research.

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