THE EFFECTS OF EXTERNAL DEBT SERVICING ON INFRASTRUCTURE SPENDING IN ZAMBIA

MWILA GRACE KAPINDULA (BSC)

**A dissertation submitted in partial fulfillment of the requirements for the degree of
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DECLARATION

I Mwila Grace Kapindula declare that this dissertation and its contents represent my own work and have not previously been submitted for the award of a degree to this or any other university.

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CERTIFICATE OF APPROVAL

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Signature: _____ Date: _____

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Chairperson-Board of Examiners:

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Supervisor:

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DEDICATION

This dissertation is dedicated to my Father, Mr. Francis Mulenga Kapindula, whose constant encouragement has helped me believe that I can achieve anything I put my mind to.

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Lastly and most importantly, I have more than ten-thousand reasons to thank my heavenly Father for His divine grace and provision. I have enjoyed good health and found favour in unlikely places throughout this journey up until the completion of my dissertation. .

ABSTRACT

Public expenditure particularly on infrastructure has been shown to be of paramount importance to the development of many economies, including Zambia. Like many developing and developed countries, Zambia, has accessed and continues to access public external debt to finance infrastructure development. However, in light of the increased levels of public external debt contraction since 2011, how would the Zambian government approach the process of budget allocation towards infrastructure development in response to the debt servicing charges?

This study examines the effect of external debt servicing on infrastructure expenditure in Zambia over the period 1970-2014. The study reviews both empirical and theoretical literature to identify other determinants of infrastructure spending in debt dependant countries like Zambia. The secondary data used in this study was sourced through the World and Africa Development Indicators database. Using time series data, an empirical analysis based on ARDL model and the Bounds Test approach of co-integration, the results show that that in the long-run debt servicing has a significant negative effect on infrastructure spending.

The results of the empirical analysis show that, the major determinants of infrastructure expenditure in Zambia also includes; real effective exchange rates, total government expenditure, governments' gross domestic savings and political factors such as debt forgiveness.

The results found show that the gross domestic savings and the HIPC debt reduction had significant positive effects on infrastructure spending in Zambia. There is no significant evidence of association between overall government expenditure and real effective exchange rates on infrastructure expenditure in the long-run. Therefore it could not be concluded that an increase in the allocation of resources to overall government expenditure boosts expenditure on infrastructure

To facilitate the continued development of the country's` infrastructure in this debt era, the studies suggests a change in debt contraction preferences, improved management of debt and to align debt resources to infrastructure projects that can produce revenue.

Keywords: Debt servicing, public external debt, Displacement Theory, infrastructure spending, Zambia.

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ACRONYMS

7NDP	Seventh National Development Plan
ADF	Augmented Dickey Fuller
AfDI	Africa Development Indicators
AFRODAD	African Forum and Network on Debt and Development
ARDL	Auto Regressive Distributed Lags
BOZ	Bank of Zambia
CSO	Central Statistical Office
CVA	Construction Value Added
CGE	Computable General Equilibrium
DFR	Debt Forgiveness Ratio
DSA	Debt Sustainability Analysis
DSR	Debt Service Ratios
ECM	Error Correction Mechanism
EG	Engle and Granger
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GDS	Gross Domestic Savings
GNP	Gross National Product
GTS	General to specific
GOVT	Government expenditure
HIPC	Highly Indebted Poor Countries
HIPC-CP	Highly Indebted Poor Countries- Completion point
ICT	Information and Communication Technology
IDA	International Development Association
IS	Infrastructure Spending
IMF	International Monetary Fund
MMD	Movement for Multi- Party Democracy
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PII	Public Investment in infrastructure
REER	Real Effective Exchange Rate
SNDP	Sixth National Development Plan

TDS	Total Debt Service
USA	United States of America
US$	United States Dollar
WDI	World Development Indicators
WSS	Water Supply and basic Sanitation
ZDA	Zambia Development Agency
ZIPAR	Zambia Institute of Policy Analysis

CHAPTER 1
INTRODUCTION

Public expenditure on infrastructure is considered an important element in the development process especially in developing sub Saharan countries. Infrastructure provision is however influenced by various factors such as government revenue, rate of urbanization, openness, population density and external debt stock. Particularly for developing countries, most public infrastructure is funded through external debt. This however has often generated debate among the various stakeholders especially as it relates to sustainability.

Some scholars have argued that external debt can hinder the rate of economic growth. Krugman (1988) asserts that the effectiveness of external public debt is dependent upon the debt service charge. This is because as a country's debt increases, the repayment on the external debt also leads to an increase in taxes which ultimately derail the economic growth of a country. Similarly, Agénor and Montiel (1996) showed that an increase in public debt is usually accompanied by increases in taxes which discourage private sector investment. In addition to higher taxes, investors are discouraged due to the high uncertainty regarding the borrowing government's decision on how the debt is settled. The infrastructure and social sectors are also harmed by high debt service payments because resources available for these sectors are channeled to debt repayment (Savvides, 1992). As per Green (1989) empirical analysis; debt service charges where the most significant reason why sub- Saharan countries were unable to settle their debt in the 1980s.

Like many developing countries, Zambia has equally embarked on an ambitious rapid infrastructure development programme which is financed through external debt. Since its independence in 1964, Zambia has contracted debt either from domestic or international institutions to advance national development programs. The country has gone through many phases with regards to its debt history and debt service payments which are a charge over the contracted debt.

It is against this backdrop that the study seeks to find out whether investment in infrastructure has been hampered by the debt service charges, which are a consequence of accumulation of public external debt, in Zambia. In this study, infrastructure was defined to include roads, railways, airports, power generation and transmission, ports, communications, water and waste, together with social infrastructure, such as hospitals, schools and housing.

1.1. Background

Zambia is a country located in Southern Africa with a population of approximately 15.5 million people (CSO, 2011). Despite recent economic downturns, Zambia is said to be one of the fastest growing economies of the World with an annual economic growth at 7.7 per cent between 2011 and 2015 (Sichikwenkwe, 2015). Some of the setbacks experienced most recently include; declining copper prices, which led to an increase in commodity pricing, general weakening of global trade, unstable currency and high inflation, among other things (CSO, 2016).

Zambia gained its independence from its British colonialists in 1964. Until the 1991 general elections, the Country had been under the leadership of Dr. Kenneth Kaunda, a period referred to as the First Republic. Consistent with economist Hans W. Singer quoted in Degefe (1992), Zambia like most developing countries experienced its golden years during the 1950s and the 1960s due to the high economic growth rate owing to limited dependence on external resources. In the 1980s, Zambia's ability to implement national plans was affected by the high levels of debt which only became sustainable towards the end of 2013. The excessive borrowing was caused by many factors some of which included the 1973 global oil crisis and declining copper prices. The 1970s were 'debt- led' as this was the time which the Country began to borrow heavily on the international market to finance the growing resource gap. For the most part of the 1980s, the cost of servicing the debt grew so much that in 1986, the Country spent approximately 86% of its export earnings on debt service and the rest of the sectors of the Country`s economy had to split the remaining 14% (Jubilee USA Network, 2008). According to Mwansa (1998) cited in AFRODAD (2003), in an effort to manage the Debt crisis, Dr. Kaunda made a pronouncement in 1987 that only 10% of Zambia's export earnings were used for debt service payments and he delinked the International Monetary Fund (IMF) and World Bank from the country's economic programmes. He instead increased strict reliance on local resources to finance growth as opposed to been aid dependent. However, this led to a situation where the Country was isolated by the international community and it was restricted from receiving development assistance of any kind. The debt crisis continued during the Country's second republic under the leadership of Dr. Chiluba, such that in 1990, debt service payments accounted for 23.5% of Zambia's GDP. The figure had dropped to 7.8% in 2000, a result that can be attributed to Paris Club partial debt cancellations and rescheduling's offered to Zambia by the IMF and the World Bank (AFRODAD, 2003).

The channels through which government debt is found to affect other sectors of the economy is through (i) higher interest debt payments (ii) higher taxes in future (iii) higher interest rests and (iv) private sector crowding out. Firstly, the borrowing country is at risk of defaulting on debt repayments obligations. This can affect the borrowing country's credit rating which in turn makes it difficult to access debt in future. Secondly, in order to keep up with debt repayment obligations, a country with a large debt burden has to print more money, increase its citizens' tax or introduce spending cuts in various sectors of the economy. The aspect of printing more money reduces the currency value of that country. Thirdly, which also summarizes the fourth point, a large debt burden means that the country is using money meant more for productive projects in the private sector for debt servicing and this makes borrowing expensive for private firms as it increases interest rates (Checcherita & Rother, 2010).

In 2005, Zambia attained the Highly Indebted Poor Countries Completion Point (HIPC- CP), in which 36.2% of the Country's multilateral and bilateral debt was cancelled. This cancellation translated into a debt reduction from US$7, 080 million to US$ 4, 519.3 million from 2005 to the end of 2005 (AFRODAD, 2015). The HIPC Completion Point refers to a point at which after having implemented the full Poverty Reduction Strategy Programme for at least one year, the country concerned received a stock of debt relief. The bulk of the assistance under the HIPC Initiative came without any further policy conditions (JCTR, 2006).

Part of the Zambian debt that was cancelled in 2005 was obtained in 1979 to purchase agricultural equipment. However, seven years prior to 2005, due to the Country's inability to service the debt, Donegal, a hedge fund, bought Zambia's debt. After 2005 debt cancellation, the Zambian government was sued by Donegal for non-settlement of the debt and as a consequence the court ruled that the Zambian government pay US$15.4 million which accounted for 65% of what was saved in debt relief (Jubilee USA Network, 2008).

Unfortunately, despite the Highly Indebted Poor Countries (HIPC) debt cancellation program in 2005, Zambia paid over three times of its combined budget for health, education and social security in debt service (Jubilee Zambia, 2008).

Since the debt was cancelled in 2005, Zambia's external debt rose from approximately US$ 934 million in 2006 to US$ 3.179 million in 2012 representing a 240% increase (Halwampa, 2012).

In 2017, the tenth Zambia Economic Brief report showed that following the 2005 HIPC debt relief program, the Country has rapidly accumulated at least US$13.3 million of debt which

accounts for 60% of the Country's gross domestic product (GDP). The study showed that the debt stock puts the Country at a high risk of debt distress (The World Bank, 2017). Owing to the fact that the debt stock of a country accounts for its GDP, the study reviewed the relationship between Zambia's GDP and its construction value added measured in current US$. The graph therefore shows the interaction between the two variables using data was obtained from the Africa development Indicators database.
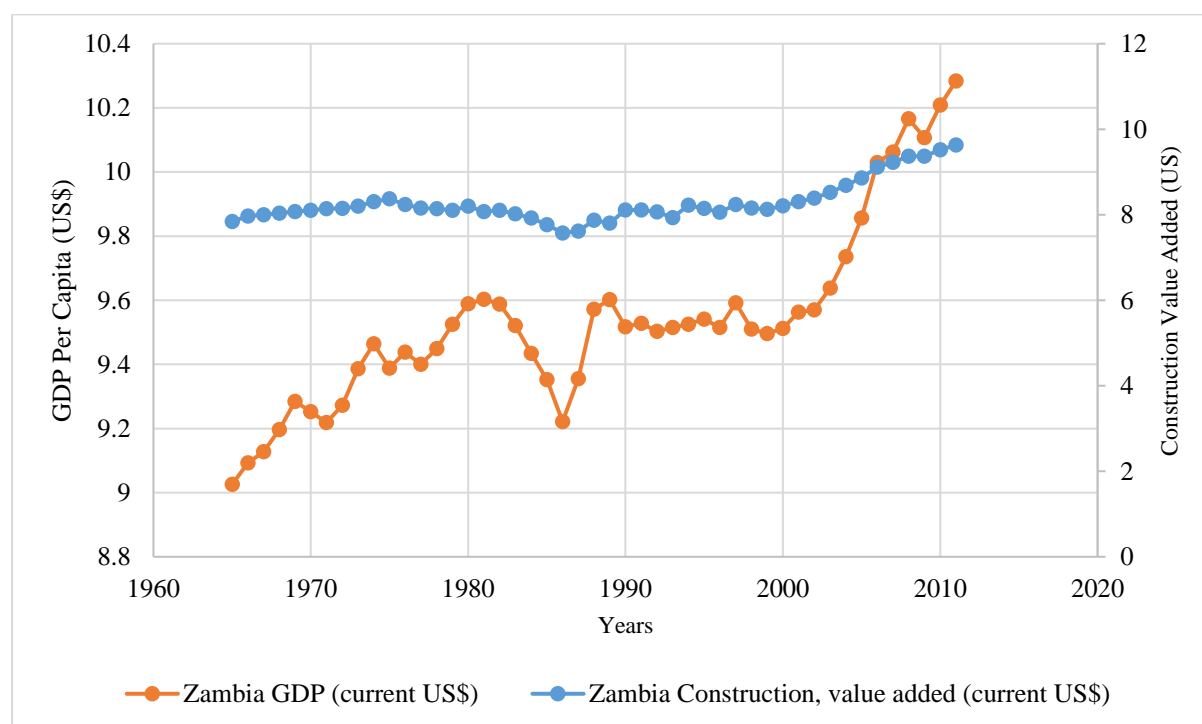
Figure 1. 1 Relationship between Gross Domestic Product and Construction Value added measured in current US$

The graph showed that the two variables are positively correlated. It was also observed that points in the graph where GDP decreased, the Construction value added also decreased. When the country experienced a debt crisis, between 1980- 1990 the GDP and construction value added decreased although a steady increase in both variables was registered during the same period after 1985.

The drastic increase in Zambia's debt levels since 2006 was partly due to the country's ability to access different sources of external debt. There are four main that the Country has accessed debt; non-concessional borrowing by bond issuance, private capital flows from China, selling of securities to commercial bands and borrowing by state owned enterprises from investors. This rapid increase occurred even more so between 2012 and 2016, shortly after the 2011 general elections. These elections saw the Patriotic Front take over government from the MMD after precisely 20 years in power. Direct consequences of a rapid increase in debt are the debt servicing costs. For instance, Zambia must pay back, in one day, US$750million Eurobond in

2022 and US$1 billion Eurobond in 2024. The third US$1.25million Eurobond obtained in 2015 is scheduled to be paid between 2025 and 2027 (The World Bank, 2017).

According to Shabbir and Yasin (2015), how much a country borrows depends on the country's productive capacity and to what extent the debt is utilized. They stated that to avoid a debt trap brought about by the high cost of servicing the debt, the borrowing country should maximize the returns from the debt.

1.2.   Zambia's Infrastructure Profile

Since its independence in 1964, Zambia's infrastructure has seen a dramatic transformation. Most recently there have been targeted interventions by the Zambian government relating to the improvement of the transport infrastructure since 2011 (ZDA, 2015). Some of these include obtaining Eurobonds in 2012 and 2015 in which approximately 91% and 34% of the debt respectively where slated for infrastructure development (The World Bank, 2017). This development is especially important because Zambia being a landlocked country relies heavily on a good transport system to facilitate its imports and exports Therefore, it is imperative that Zambia registers significant improvements in its transportation infrastructure. The steps to ensuring that this is achieved is evidenced by the Link Zambia 8000 project (Accelerated National Roads Construction Programme) that the Country embarked on in 2011 which is aimed at building 8000km of high quality single and dual lane roads throughout the Country (ZDA, 2015).

Additionally this rapid improvement in infrastructure development programs may be attributed to the fact that it is a priority in the Sixth National Development Plan (2011 to 2015) and Seventh National Development Plan (7NDP). One of the outcomes specified in the 7NDP (2017-2021), is to contribute towards the achievement of improved transport and infrastructure systems by 2021.

However, the World Bank (2017), stated that the five year Link Zambia 8000 Project, from 2011-2016, was overly ambitious and was not well planned as it lacked a detailed implementation framework. When the available resources required for implementation of the Link Zambia 8000 Project became lower than US$6 billion, the process of selecting roads became random and lacked the evidence of social and economic returns.

Despite the inconsistencies in infrastructure development the Bank of Zambia (BOZ) in its 2014 report showed that growth in the construction sector was strong at 8.5% compared to 11.4% in 2013. This infrastructure development included public infrastructure such as

residential housing and shopping malls (BOZ, 2014). The 2015 BOZ annual report showed that road infrastructure was over budget by 34.4%. This can be attributed to the fact that according to the 2009 Auditor General report cited in the World Bank Report (2017), the cost of construction of roads in Zambia has been very high in comparison to other countries in the region. These much higher costs increase opportunities for corruption in the transport and storage sector. Therefore, in 2015, the construction sector only grew by 1.4% (BOZ, 2015). The construction sector further recorded a slower growth in 2016, falling from 18.0% in 2015 to 4.5%. The decline was attributed to the reduced implementation of various public infrastructure development projects and coincidentally an early election took place due to the demise of the president at the time. The infrastructure expenditure particularly on roads was below target by 56.5% (BOZ, 2016). This was quite disappointing considering the Zambian government borrowed heavily for supposed infrastructure development.

Therefore, in light of the debt contraction trends that prevailed since 2011, the graph showed the relationship between debt service and construction value added from 1970-2014. The data was obtained from the African Development Indicators database and both variables were measured in current US$.
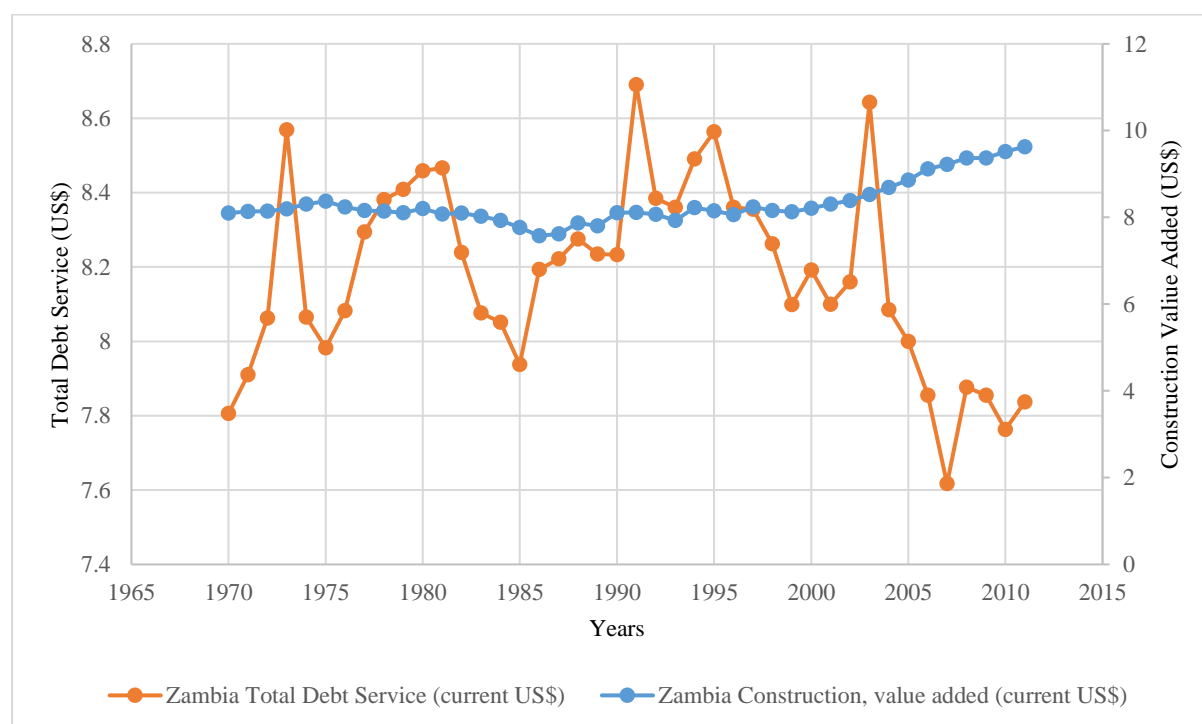
Figure 1. 2 Relationship between Total Debt Service and Construction Value added measured in current US$

The graph showed that at points where the debt service cost increased there was a decline in the construction value added variable. It was observed from the graph that following the HIPC Completion point –CP in 2005, the construction value added started to increase.

1.3. Zambia's Recent External Debt and Debt Service Profile

In 2014, according to the Bank of Zambia (2014) annual report, the total stock of outstanding external debt for the country rose by 35.3% to US$4,751.9 million at end-December 2014 from the US$3,548.0 million recorded at end-December 2013. The increase was predominantly as a consequence of the US $1.0 billion Euro bond issued on the international capital market during the year. In the same year the, the Government external debt s`1qweervice amounted to US $265.0 million, representing an increase of 4.1% from US $238.6 million in 2013. The stock of external debt continued to rise in 2015 as it increased by 39.6% of which 66.7% of this increase was as a result of the third US$1,250 million Eurobond issued by end of December of the same year. In 2016, a 3.8% increase in the stock of external debt in 2016 was recorded and as at December of the same year the debt was sitting at US$6,850.9 million. Similarly the external debt service has been increasing exponentially. In 2016, external debt service was at US$ 585.0 million which represents a 53.3% increase from 2015 which also increased by 53.6% from 2014 figure (BOZ, 2016).

Therefore, in light of this increase in the Country's debt, using data from the Africa Development Indicators, the study showed using a graph how Zambia's total external debt had in the past affected the total debt service charge 1970. This comparison was done to better understand how the current debt stock will impact the debt service charge.

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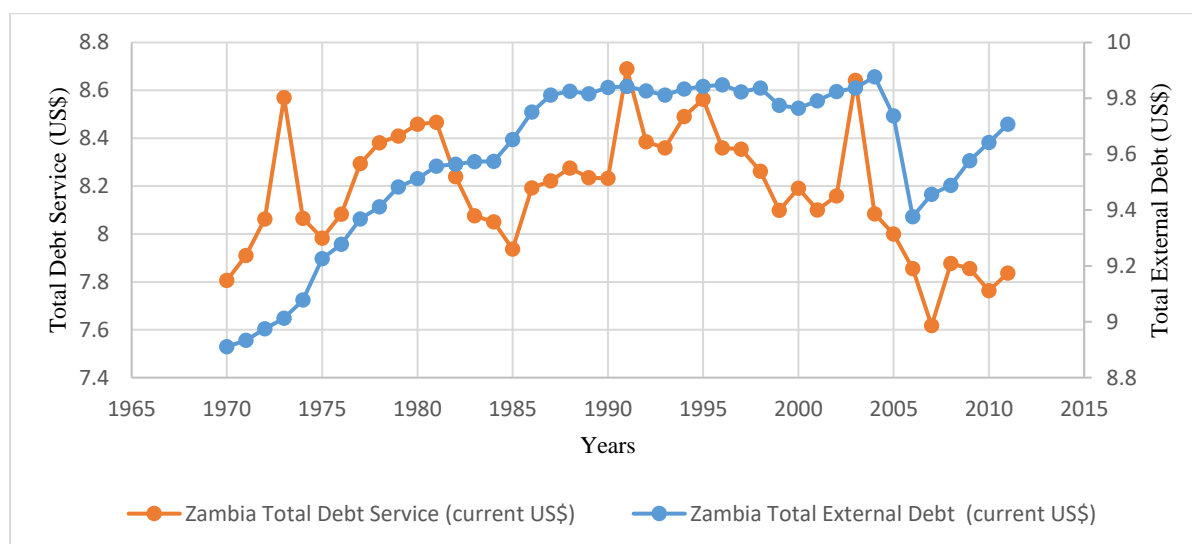
Figure 1. 3 Relationship between Total Debt Service and Total External Debt measured in current US$

From the trends shown in the graph, it can be seen that with an exception of 1975, as debt increases the debt service charge increases and the converse also applies. Therefore, the study concluded that in Zambia, an increase in debt means that the debt service also increases.

1.4. Statement of the Problem

Debt servicing charges have an impact on funding of different sectors in a country's economy. While there have been various literature on how debt servicing affects other sectors such as education and health, literature on the effects of external debt liability on infrastructure spending is very scanty. It is therefore very difficult to draw conclusions through the review of literature, especially in third world countries, whether or not external debt servicing affects spending on infrastructure projects. Therefore, it is this gap in literature that this research seeks to cover.

1.5. Study objective

1.5.1. Main Objective

The objective of this study is to determine how and to what extent infrastructure spending is affected by external debt liability in Zambia.

1.5.2. Specific Objective

The study has two specific objectives which include:

i.   To determine the effect of external debt servicing on public infrastructure spending in Zambia;

ii.   To draw policy implications based on the findings.

1.6. Hypotheses of the study

The main hypothesis that guided this study was;

i.   Increase in total debt service has a negative impact on Infrastructure spending

1.7. Significance of the Study

The benefits that a country can derive from the presence of good infrastructure had been documented in various literatures. At the time of the study, Zambia's infrastructure was still lagging behind in comparison to other countries in the region. Therefore, it was imperative that best practices and funding sources are used to advance this infrastructure development agenda. While there have been studies to access the effects of debt service and other determinants on public expenditure in education and health sectors in highly indebted poor countries, very limited studies have looked specifically at infrastructure.

The findings of this study had contributed greatly to the benefit of not only Zambia, but also other developing countries that share a similar context in that they are in a way dependent on public external debt. The findings added to the body of knowledge as the study showed the critical areas that help advance expenditure on infrastructure. This research provided credible and thoroughly thought out references for policy makers looking for ways to improve the Country's infrastructure. The study also provided a basis for further research on factors affecting infrastructure expenditure in Zambia using other variables that have not been used in this study.

1.8. Methodology, Data Source and Limitation of Study

The study employed a non-experimental design using secondary data from the period of 1970-2014. The researcher selected Zambia as the case study. The Country time series data was taken from the World Development Indicators Database and Africa Development indicators database. The methodology for analysis is formulated based on the Granger (1981) and, Engle and Granger (1987) Auto Regressive Distributed Lags (ARDL) cointegration technique. The ARDL cointegration technique is used in determining the long-run relationship between series with different order of integration (Pesaran and Shin, 1999, and Pesaran *et al*. (2001). This means that the long-run relationship properties are intact. In other words, the means and variances are constant and not depending on time.

The study faced many limitations including the lack of country level statistics and good proxies for infrastructure expenditure. This is due to the fact data on infrastructure spending is not readily available or collected by the agencies in Zambia. The information for some variables in the study collected from WDI and Africa Development Indicators Database was only available after 1971 and not 1964 as desired by the researcher. The other limitation was time frame of the study as the researcher had to learn the econometric views data analysis package to run the ARDL Model.

1.9. Organization of the Study

The dissertation is organized as follows. Chapter two provides the literature review, the theoretical review, a background of Zambia's outstanding debt and infrastructure spending relationship, an empirical review of the impact of external debt liability on infrastructure and general public spending. Chapter three gives the methodology used in the study, model specification and estimation procedure. The presentation, analysis and discussion of empirical

results are covered in chapter four. Chapter five finally gives the conclusion, policy implications and recommendations for future study.

CHAPTER 2
LITERATURE REVIEW

2.1.   Introduction

The previous chapter provided an introduction and overview of the study. This Chapter provides a detailed review of literature. Within this Chapter, a background of Zambia's debt stock in relation to infrastructure spending is provided. A review of existing theories on debt servicing and infrastructure spending is then provided, followed by a review of empirical studies. A critique of literature reviewed is then presented followed by a table summarizing the key documents reviewed.

2.2.   Background of the Outstanding Debt and Infrastructure Spending Relationship

Zambia has over the last few years issued three major bonds which include; the US $750 million Eurobond and US $1.25 billion in 2012 and 2015 respectively. The Zambian government issued these bonds to finance the various infrastructure projects that the government is undertaking across the country, in the transport, energy and social sectors (Yambe, 2015). While government borrowing is not inherently bad, growing debt and large expenditure on debt servicing costs are a severe burden to developmental expenditure (Sanderatne, 2011)

Debt contraction in most developing countries has been seen as a source of economic problems and Zambia is not exempt from challenges stemming from excessive borrowing. Nkonde (2015), writing in the Lusaka Times Newspaper adds that, excessive borrowing is associated with several risks and Zambia is at the brink of falling into the debt trap. This is because since its independence in 1964, the country has never accumulated this high level of debt. It is feared that this high level of debt and subsequent debt service charges negatively impact infrastructure spending.

To further understand the infrastructure spending deficit, an African Infrastructure Country Diagnostic Country Report prepared by Foster and Dominguez (2010) showed that the funding gap in Zambia's infrastructure spending was at 0.5 billion United States dollars (US$) per year. In table 2.1, Briceño-Garmendia et al. (2009), showed that while there are spending needs in the transport sector in Zambia, the larger portion of the deficit was mainly taken up by the power and water sectors. From the table, the spending needs were all lagging behind in all sectors.

Table 2. 1 Funding gaps by sector

	ICT	Power	Transport	WSS	Total
Spending needs	(218)	(631)	(289)	(471)	(1,609)
Existing spending	90+	180	245	158	673
Efficiency gains	n.a	160	59	96	315
Funding gap	n.a	(291)	15	(217)	(493)
Potential for reallocation	0	30	65	0	85

n.a. = not applicable.

The Zambia Development Agency (ZDA) stated that the Country's infrastructure deficit was due to the fact that the Government of the republic of Zambia had limited resources to invest in infrastructure. The collection of revenue by government through taxes and/or levies was not sufficient to meet the increasing demand for public infrastructure facilities. Additionally, there had been a reduction in the budget support received from cooperating partners from 2014 onwards, forcing Government to consider alternative sources of funding to sustain the budget. In 2014, the Country's external debt was about US$3.2billion and US$1.852 million accounted for internal debt. With the proposal to finance 24.6% of the 2014 budget using debt, the governments' capacity to contract more debt for infrastructure development drastically declined (ZDA, 2014). There have been varying reports about what the real debt figures are in Zambia. For example, contrary to the ZDA (2014) report, the Debt Sustainability Analysis (DSA) conducted by the Zambia Institute of Policy analysis (ZIPAR), in the same year, revealed that Zambia's total public debt was estimated at around US$8.8 billion, with external debt standing at US$4.8 billion. However, with the government's issuance of a US$1.25 billion Eurobond in July 2015, the country's external debt stock was pushed to over US$6 billion and has since continued to rise. Most recently, the external debt stock as at May of 2017 was US$ 7.2billion and US$3.86 million domestic debt (The World Bank, 2017). The IMF suggests that the Zambian government slows down the rate of debt contraction to ensure sustainability of debt. It was also recommended that the selection, monitoring and procurement process of infrastructure projects should be done to in a transparent manner so as to ensure these projects deliver value for money (IMF and IDA, 2017).

2.3.   Theoretical Framework

This study was anchored on public expenditure theory by Allan T. Peacock and Jack Wiseman (1961) otherwise known as the Displacement Theory Through a time pattern analyses of public expenditures for the United Kingdom from 1890 to 1955, Peacock and Wiseman argue that

government spending tends to evolve in a step like fashion as opposed to a straight and continuous manner. The political theory of public determination was the basis of their argument which states that "governments like to spend more money, that citizens do not like to pay taxes, and that government has a responsibility to provide public goods for its citizens." Public expenditure has a tendency to grow on account of a systematic expansion of government activities, both in terms of intensity and quality. In addition, social and other disturbances arise which lead to an increase in public expenditure which the available revenue cannot meet and as a consequence, with rising expenditures, the government is forced to borrow leading to public debt. This movement from initial low-level expenditure and taxes to meet to new and high-level expenditure and taxes is known as the displacement effect. Peacock-Wiseman hypothesis emphasize the fact that public expenditure has a natural tendency to increase overtime (Peacock & Wiseman, 1961)

2.4. Empirical Review of the Impact of External Debt Liability on Infrastructure and General Public Spending

2.4.1. Relationship between Improved Public Infrastructure and Economic Growth

Public expenditure on infrastructure has been extensively researched and its importance cannot be overemphasized. With a focus on transport and telecommunications, some authors have empirically examined the factors that influence public expenditure on infrastructure. Some of these include Randolph *et al*. (1996) and Fedderke *et al*. (2006). There is a however very limited empirical evidence on how external debt service affects public expenditure on infrastructure particularly in developing countries. The inadequacy of this empirical information justifies this study. Given the high level of debt accrued by the Zambian government and the importance of infrastructure investment in the overall development of the economy it is important that this investigation is done. To show the importance of infrastructure development, earlier researchers focused on trying to establish if there is a positive relation between investments in public infrastructure and the productivity of the private sectors of the economy.

Using a sample of forty-eight (48) states in the United States of America (USA) from 1970 - 1986 and the Ordinary Least Squares (OLS) estimation method, Munnell (1990) studied the important role of the public sector in funding infrastructure to stimulate economic development. The conclusion was that; states that have invested more in infrastructure tend to have greater output, more private investment, and more employment growth. Presenting an opposing view to that of Munnell (1990), a panel study conducted of ninety-eight (98) countries, using

ordinary least squares as the estimation method found that there is little relation of growth to the quantity of public investment. Additionally, the study shows that public investment has a downside as it is viewed as consumption. This view introduces distortions, such as high tax rates, but does not provide an offsetting stimulus to investment and growth (Barro, 1991).

Haan *et al.* (2007) and Estache *et al.* (2012) show that improved infrastructure accelerates urbanization and also improves regional integration. The study was conducted in six (6) African countries and it was aimed at exploring the impact of scaling up infrastructure. They make the assumption that this impact is dependent on the choice of funding that is used to improve the infrastructure, as inefficient funding could counter the positive returns of public infrastructure. The study compares various infrastructure funded by different means. The study concludes using Computable General Equilibrium (CGE) that funding using donor aid has negative consequences arising from large increases in the value of a country's currency. This increase is as a result of injecting into the economy large sums of foreign currency which can be administered as to foreign aid, foreign direct investment among others. This is referred to as the Dutch disease. The negative consequences are however dependent on the type of investment performed with the funds. Other studies that show a positive association between expenditure on infrastructure and economic growth include that of Aschauer (1989), Baldacci *et al.* (2004) and Agénor and Dodson (2006).

From the literature reviewed in this study, it could be concluded that investment in infrastructure has a positive effect on the economic growth of a country.

It can therefore be said that like Zambian government like in many other economies seeks to improve the country's' infrastructure in order to facilitate the growth of the economy. The study therefore reviews literature that shows what findings other scholars have established on the impact of debt service charges on various aspects of a country's economy.

2.4.2. *Impact of External Debt Servicing on Public Investment in Infrastructure*

Gohar *et al.* (2012) used the least square multiple regression method to investigate the impact of external debt servicing on the growth of low-income countries using annual panel data of thirty-six (36) low income countries taken from 1990-2008. The study finds that the impact of external debt servicing is quite adverse on economic growth and it was concluded that low income countries should go for the option of debt forgiveness, invite regulated foreign direct investment (FDI) and encourage exports.

A study undertaken to assess the influence of public indebtedness on public investment in infrastructure (PII) in the period 1987- 2001 for seven (7) Latin American countries finds that exogenous debt (exogenous in this context is defined as debt changes that are not the result of PII decisions) increases do not reduce PII. On the contrary, the study finds that the more a country plunges further into debt, the more PII increases (Lora, Eduardo, 2007). However, there have not been many studies of this nature to compare to the findings of this report.

Fosu (2009) studied the impact of external debt service payments on public expenditure composition in thirty-five (35) Sub-Saharan African countries over 1975-1994, a period preceding the Highly Indebted Poor Countries (HIPC) initiatives and found out that debt servicing shifts spending away from social sector, health and education. Therefore, as the debt servicing grows there is reduced funding going to the social and health sector in these countries.

Using an estimated Model for Pakistan Aggregate Investment from 1978-2009, Kazim *et al.* (2009), show that debt service payments affect investments. However, the intensity of the effects differs in nature depending on the crediting institute. It is evident from the results that debt services to Multilateral Creditors and other Private Creditors have a negative impact on Pakistan's Gross Private Capital Investment. Debt from Bilateral Creditors contributes positively for aggregate investment.

 Drehmann and Juselius (2012) investigate whether or not debt service costs affect macroeconomic and financial stability. The study comprised twenty-seven (27) countries and debt service ratios (DSR) as an estimation method. The findings were show that DSR produces a very reliable early warning signal ahead of financial crises which implies that the DSR can serve as a useful supplementary indicator for the build-up of vulnerabilities in the real economy and financial sector. The study found that the purpose for which external debt is acquired, which is to fund development, is depressed by debt service payments because it takes up the bulk of the resources as opposed to advancing the development agenda.

As highlighted previously, the study has shown that the debt in Zambia has been growing exponentially over the last decade or so, therefore the literature further highlights the impact of growing debt on a country's economy and at what point debt accumulation may pose serious challenges to a country's economy as studied by various scholars.

2.4.3. *Impact of External Debt Accumulation on Economic Growth*

Elmendorf and Mankiw (1999) found that one important way in which public debt accumulation can affect growth is that of long-term interest rates. Higher long-term interest rates, resulting from more debt-financed government budget deficits, can crowd-out private investment, thus dampening potential output growth. This implies that with rising interest rates required to pay back the debt in the public sector; this may induce an increased net flow of funds from the private sector into the public sector by increasing private sector interest rates as well. An increase in private sector interest rates leads to decrease in their spending.

A study was conducted by the European Union Central Bank to assess the impact of high and growing government debt on economic growth in the euro area. Using data in a panel of twelve (12) euro countries over a period of forty (40) years starting in 1970, the study finds a highly statistically significant non-linear relationship between the government debt ratio and per-capita GDP growth for the twelve (12) pooled euro area countries sampled. The study concludes that public debt on average would only have a negative effect on economic growth when it exceeds 90-100% of GDP threshold (European Union , 2010).

Kontbay (2013) studied the thresholds of public debt-to-GDP and total external debt-to-GDP ratios above which economic growth is impaired. The second objective was to examine the effects of debt overhang on the sources of growth. The study used large panel data set of developed and developing countries from 1970-2009. Findings showed that for high income OECD countries, the level of public debt above which the growth becomes a burden is 69 percent, while it is forty-seven (47) percent and thirty (30) percent for middle and low-income countries respectively. For external debt the thresholds are eighty (80) percent, fifty (50) percent and seventy (70) percent for high, middle and low-income OECD countries respectively. However, despite these thresholds the study finds that the growth is in no way affected negatively by an increase in external debt, the negative relationship between debt and growth can be attributed to the decrease in capital stock accumulation for high debt levels.

However, Chudik *et al*. (2015), conducted an empirical study using data of forty (40) countries (grouped into developing and advanced) over a period from 1965-2010 find that a universally applicable threshold effect in the relationship between public debt and economic growth, does not exist once the impact of global factors and their spillover effects are accounted for. The study does however find that there are significant negative long-run effects on output growth as a result of a build-up of external debt. Another study Pescatori *et al*. (2014) found that there is

no evidence of any debt threshold above which growth prospects are compromised in the medium-term.

A debt sustainability report done by the IMF and IDA (2017) on Zambia, shows that the country is headed towards a debt crisis. This is because the public and publicly guaranteed external debt present value (PV) breaches the 40 percent of GDP threshold. This is owed to the fact that the rate at which the country has accumulated debt has been considerably high. The study recommends that the Country ensures that the process of investment which includes selection, procurement and monitoring of infrastructure projects is strengthened to ensure that public investment projects are up to the standard of their cost.

An investigation by Ejigayehu and Persson (2013) on the effect of external debt on economic growth in eight (8) heavily indebted poor African countries from 1991-2010 using the random effect approach mode of estimation finds that debt affects economic growth by the debt crowding out effect rather than the debt overhang effect. They define the debt crowding out effect as a situation when income from export is used to pay the accumulated debt.

2.5.   Critique of Literature

A review of the literature showed that infrastructure investment contributes positively to the economic growth of a country. Since literature on the impact of debt service on public expenditure particularly infrastructure is limited, the research considered literature that shows the impact of public debt and/or debt service on economic growth. Literature does not show explicitly if there is a negative relation between debt service and infrastructure spending as data is very limited.

A further literature review also shows that the determinants of public expenditure cannot be generalized, whether using country specific or cross-country analysis. Results of studies reviewed in this research on the determinants of public expenditure also vary depending on the methodology, approach or proxies used. In conclusion, coupled with the fact that there is very limited literature on this subject, there are very few common grounds identified as potential determinants of public expenditure. The study reviewed literature to establish what the acceptable limits of public debt are to establish what some of the policy implications of exceeding this threshold may be. The findings show mixed reviews most of which show that an increase in the public debt does not necessarily translate into a negative economic growth. What is observed in most studies is that an excessive accumulation of debt in the country leads to   a   decrease   in   capital   stock   accumulation

Table 2. 2 Summary of Empirical Studies reviewed in this Research

The summary of empirical studies in this table are arranged in alphabetical order

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Agénor and Dodson (2006)	Review of various literature studying the interactions between public infrastructure, education and health outcomes	Not specified	Ordinary Least Squares		Findings showed that public infrastructure had a direct impact on economic growth by a) Indirectly enhancing the productivity of workers b) Improving health and education outcomes c) Improving private capital by enhancing its durability d) Facilitate mobility and adjustment costs related to private capital to put them to more e) Enhancing profitable activities
Aschauer (1989)	United States of America (USA)	1949-1985	Ordinary least squares		The study concluded that core infrastructure on things such as sewer and water systems, mass transit, airports, street infrastructure and highways had more effect on productivity of the overall economy. Non-military capital was dramatically linked to enhancing productivity while the reverse is true for military infrastructure.

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Baldacci *et al.* (2004)	One hundred and twenty (120) developing countries	1975-2000	Standard least squares	Not stated	The study established a positive effect of social spending in education and health on economic growth. Results showed that spending on education and health leads to higher capital accumulation in these sectors which encourages economic growth. In addition to this, it was also found that implementation of other policy interventions like budget deficit reductions, controlling inflation and improving governance was also instrumental in moving countries towards the Millennium Development Goals (MDGs).
Barro (1991)	Ninety-eight (98) countries selected from sub-Saharan Africa and Latin America	1960-1985	Ordinary Least Squares	Not specified	The study found that government consumption introduced distortions, such as high tax rates, but did not provide an offsetting stimulus to investment and growth. On the other hand, the findings showed that there was little relation of growth to the quantity of public investment. The study also found that political instability discouraged public investment and economic growth in the period under review.

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Cashel-Cordo and Craig (1990)	Forty-six (46) less developed countries	1975-1980	Least squares	Not stated	The study examined the effects of aid on developing countries' public sector budgets. The findings showed that it is crucial to examine the form of aid used to fund public sector projects in order to determine the impact it has. Findings show that aid provided by the IMF has the greatest impact on recipients. However, soft loan aid was found to be quite stimulative in the overall economy.
Chudik *et al.* (2015)	Forty (40) advanced and developing countries	1965- 2010	Least squares estimates		The study found no evidence of a universally applicable threshold effect in the relationship between economic growth and public debt. However, the study found that a significant negative long-run relationship exists between public debt accumulation and output growth.

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Drehmann and Juselius (2012)	Twenty-seven (27) countries	1980-2012	Debt service ratio	Obtaining accurate estimates of the average remaining maturity, in particular over time, is more difficult due to data limitations as detailed loan-level data are generally not available	Defined as interest payments and debt repayments divided by income, the Debt Service Ratio (DSR) captures the burden imposed by debt more accurately than established leverage measures, such as the debt-to-GDP ratio. The study found that the DSR produced a very reliable early warning signal ahead of financial crises. The study concluded that the DSR can serve as a useful supplementary indicator for the build-up of vulnerabilities in the real economy and financial sector. The study highlighted the benefits of monitoring the debt service costs in the economy. It also indicated that policymakers should act early when choosing to lean against credit booms, before the DSR reaches critical levels.
Eduardo (2007)	Seven (7) Latin American countries	1987-2001	Arellano and Bond estimator and ordinary least-squares regressions	Due to time sample limitations of some of the explanatory variables described led up to the unbalanced panel	The study found that exogenous debt (exogenous in this context is defined as debt changes that are not the result of public investment in infrastructure (PII) decisions) increases do not reduce PII. On the contrary, the study found that the more a country plunges further into debt, the more PII increases

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Ejigayehu and Persson (2013)	Eight (8) heavily indebted poor African countries eligible for HIPC assistance		Random effect approach	The survey only took 8 out of 26 eligible countries due to the lack of data on important variables; to overcome this problem and generalize the finding for the remaining countries, random effect approach is used in estimation.	The research found that debt affects economic growth by the debt crowding out effect rather than the debt overhang effect. They defined the debt crowding out effect as a situation when income from export is used to pay the accumulated debt.
Elmendorf and Mankiw (1999)	United States of America (USA)	1791-2010	Comparative analysis using debt data from the United States of America		The study found that one important way in which public debt accumulation can affect growth is that of long-term interest rates

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Estache *et al.* (2012)	Six African Countries	1996-2000	Computable General Equilibrium (CGE)	Not specified	The study aimed to find the impact of scaling up infrastructure investments in six African countries. Findings showed that that funding public infrastructure using foreign aid had negative consequences arising from large increases in the value of a country's currency. The increase is as a result of injecting into the economy large sums of foreign currency. This increase causes a scarcity of local currency because a larger quantity of it is required to clear the current balance of the foreign currency. It was also found that the lasting negative consequences were dependent on the type of investment performed with the funds.
European Union P.B Checcherita and Rother (2010)	Twelve (12) Euro Countries	1970-2010	Panel fixed-effects and instrumental variable estimation techniques	Not stated	The study concluded that public debt on average would only have a negative effect on economic growth when it exceeds 90-100% of GDP threshold.

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Fedderke *et al.* (2006)	South Africa	1875-2001	Time series analysis	Not stated	The study examined the sequential infrastructure improvements in south Africa since 1875. These range from an era of railway development. The findings were such that in the period under review, infrastructure appeared to encourage economic growth in South Africa. Secondly the report established that infrastructure investment had a not only a positive effect on South Africa's Economic growth directly, but also indirectly. This indirect effect was as a result of the effects of raising the marginal productivity of capital. It was also found that the evidence that economic growth is as a consequence of infrastructure investment was weak.
Fosu (2009)	Thirty-five (35) African countries	1975-1994	Seemingly unrelated regression	Not stated	The conclusion of the study was that debt servicing shifted spending away from the social sector, with similar impacts on education and health

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Gohar *et al.* (2012)	Thirty-six (36) low income countries	1990-2008	Least square multiple regression method	Not stated	The recommendation of the study was such that low income countries go for the option of debt forgiveness and invite Foreign Direct Investment. However, this was not to be overdone as the country may run into a risk of over-crowding, which may hurt the economy. Exports were found to be good to boost the economy. The study concluded that the impact of external debt servicing was quite adverse on growth so steps should have been taken to erase it in order to grow well economically.
IMF and IDA (2017)	Zambia	2017	Policy-dependent thresholds for medium policy performers	Not specified	It was found that for public and publicly guaranteed external debt the present value breached the 40 percent of GDP threshold. It was projected that this breach will rise to a peak of 44.3% by 2022, from a projected rise of 37 per cent in 2016 to 42.6 percent by 2019.

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Kazim *et al.* (2009)	Pakistan	1978 -2009	Estimated model		The results of the study showed that debt service payments affect investments. However, the intensity of the effects differed in nature depending on the crediting institute. It was evident from the results that debt services to multilateral creditors and other private creditors have a negative impact on Pakistan's Gross Private Capital Investment. In the period under review, the study found that debt from bilateral creditors contributed positively for aggregate investment.
Munnell and Cook (1990)	Forty-eight (48) states in the United States of America (USA)	1970- 1986	Ordinary Least Squares	Not specified	The study concluded that in states that had invested more in infrastructure had greater output, more private investment opportunities and more employment growth

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Randolph *et al.* (1996)	Twenty- seven (27) countries low and middle-income economies	1980-1986	Alternative ordinary least squares base regressions	Not specified	The study finds that infrastructure expenditure increases in countries with a higher level of development, a large foreign sector, while urbanization and labour force participation tends to lower them. In addition, the study also finds that When the commercial bank register an increase in the flow of foreign savings, infrastructure expenditure increases

Author	Country Covered	Period	Estimation Method	Methodological Issues	Summary of Findings
Sine Kontbay (2013)	Developed and developing countries	1970-2009	Panel Threshold Method		a) Overall, the study found that for both external and public debt, the decrease in capital stock accumulation resulted in the negative relationship between debt and growth. b) The study results show that public debt becomes a burden to the economic growth at different thresholds in different economies; 69% for high income OECD countries, 47% for middle income countries and 30% for low income countries in the period under review. c) The threshold for external debt was around 50% for middle income countries, 80% for high income OECD countries and 70% for low income group in the period under review. It was found that all countries register a decline in growth rates when the once debt thresholds are exceeded. However, at a certain point once thresholds are exceeded, an increase in each additional unit of external debt does not have a significant impact on the countries` trend growth.

CHAPTER 3
METHODOLOGY

3.1. Model Specification

This section contains the description of the research methodology, the model description and the specification of the relationship between the infrastructure expenditure and the factors affecting it such as total debt servicing, government final expenditure, real effective exchange rates, gross domestic savings and debt forgiveness and/or reduction. The chapter also discusses the data sources and sample period used and lastly the data processing and analysis were presented.

3.2. Theoretical Framework and Data

This study employs a multiple variable regression model.

The log–log multiple variable regression model is represented as follows:

$$X_t = \beta_0 + \beta_1 \log Y_{t-1} + \dots B_p Y_{t-p} + \beta_2 \log Z_{t-1} + \dots B_p Z_{t-p} + \mu_t \dots\dots\dots\dots\dots\dots (1)$$

Where: X_t is the dependent variable, Y and Z represent the independent variables, β_0 is the intercept of the model and β_1, β_2, β_P are elasticity coefficients of the variables. μ_t is the error or disturbance term.

The standard model is augmented in response to the research interest. This methodology provided information relating to the valuable link between variables of interest (Raacke-Bonds & Raacke, 2014). A correlational research method used in this study goes further to show how to variables are related; that is if they are positively or negatively correlated. Bonds-Raacke and Raacke (2014) further described that variables can be either positively or negatively correlated. Variables that are positively related vary in one direction while variables that are negatively related vary in opposite directions. This research reviewed how the different independent variables interact with the main dependent variable.

The data for this study comprised construction value added and its independent variables for Zambia from 1970 to 2014. The paper estimates multiple linear regression equation using secondary time series data for the stated period obtained from the World Development and Africa Development Indicators data portal.

The variables were chosen in accordance with the Displacement Theory and related empirical work done in the past.

Econometric view (e-view) was used to analyse the data.

The sample period is chosen due to consistency and availability in data in the period under review.

3.3. Econometric Model

3.3.1. Advantages of ARDL Approach

A linear econometric model, using the Auto Regressive Distributed Lags method was used in this study. The model included all the variables used in the study. The ARDL technique has certain advantages in comparison to other single equation estimation techniques such as General to Specific (GETS), Engle and Granger (EG) and Phillip Hansen's Fully Modified Ordinary Least Squares (FMOLS) : when compared to GETS and EG, ARDL reduces the endogeneity problems since all the variables stand as a single equation and all variables are assumed to be endogenous (Nkoro & Uko, 2016). Secondly, problems associated with autocorrelation and omitted variables are excluded because the long-run and short-run variables are estimated simultaneously. Thirdly, ARDL does not require the knowledge of the order of integration of variables, which is necessary in the Engle and Granger (1987) and conventional Granger (1981) (Nkoro & Uko, 2016). While these techniques require that the variables have the same order of integration; ARDL does not require the classification of variables into different order of integration (I (0) or I (1) (Pesaran, 1997). The ARDL approach yields consistent estimates irrespective of the orders of integration of the underlying regressors (Pesaran, 1997). For the reasons above, the ARDL technique was used to examine the effect of Debt servicing on Infrastructure spending. Secondary time series data used was sourced from the World Development Indicator and African Development Indicators from 1970 -2014.

To determine whether the these requirements are met or not, see section 3.3.2

3.3.2. The ARDL Cointegration Approach Steps

This sub- section shows how one can determine that the requirements in 3.3.1 are met.

Step 1: Testing for the Existence the Long Run Relationship of the Variables

At the first stage, in order to establish a long run relationship among the variables, the Bound F-statistic (bound test for cointegration) was computed using Eviews 9. The hypothesis of the existence of a long run relationship between the variables is tested by the value of the F-Statistic. The interpretation of the critical values is found in 4.6.

Step 2: Choosing the Lag Length which is Appropriate for the ARDL Model

ARDL approach to cointegration is applied only if a long run relationship exists between the variables. Therefore, after step 1, the study went further to find the appropriate lag length. Choosing the appropriate lag length in the ARDL model, for each of the variables, is important as it ensures there are no Gaussian Error terms. The absence of Gaussian Error terms implies that the standard normal error terms do not suffer from autocorrelation non-normality, heteroscedasticity to mention but a few. Using the Akaike Information criterion (AIC) in Eviews 9, the optimum lag length was automatically selected. The determination of the optimum lag length was done to ensure the selection of the appropriate model of the long run under laying equation. The study went further to run the ARDL Estimation output to establish the overall goodness of fit of the model. The results showed that the model selected was fit and could then be used to provide estimates of the associated error correction mechanism (ECM). The optimum lag length that was found was 3. Results of this are shown under sub-heading 4.5.

Step 3: Reparameterization into Error Correction Model of the ARDL Model

After selecting the optimum lag length, the study went further to establish if there exists a short run relationship between the variables. The study avoided regressing non stationary variables in the model as this would have given spurious results. Therefore all non-stationary variables were differenced thereby resolving the spurious equation problem. Results of unit root tests for stationarity are under sub-heading 4.4.

The regressed model however, only gives short run relationship and does not give the behavior of the parameters in the long run. Because the study was interested in both the short run and long run relationships between the variables of interest, the concept of cointegration and ECM was of utmost importance to determine. To determine the short run relationship, the ECM was run in the Eviews 9 and the results obtained are shown under 4.6.2.

3.4.   Estimating Model

The time series data spanned from 1970-2014. This was because it is the period in the data set that contained the full data of the concern of this research which included infrastructure expenditure and the factors affecting it such as total debt servicing, debt forgiveness or reduction, government final expenditure, gross domestic savings and real effective exchange rates (REER). Apart from total debt service which was the variable of interest, the other variables were used as control variables to verify what had been established in other literature.

The mathematical model was specified as follows:

$$\text{Ln (IS}_t) = \beta_0 + \beta_1 \log (\text{TDS}_t) + \beta_2 \log (\text{DFR}_t) + \beta_3 \log (\text{Govt}_t) + \beta_4 \log (\text{GDS}_t) + \beta_5 \log (\text{REER}_t) + \mu_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \text{(2)}$$

Where:

- IS_t is the Expenditure on infrastructure, measured in current US\$.
- TDS_t is the Total Debt Serviced population measured in current US\$.
- DFR_t is the debt forgiveness or reduction shows the change in debt stock due to debt forgiveness or reduction measured in current US\$. It is the dummy variable in this study. In years where debt was cancelled indicated it is shown as 1 and 0 shows absence of debt cancellation.
- Govt_t Government expenditure is the value of all government spending on consumption which includes both spending on capital and recurring expenditure measured at current prices in the US\$
- GDS_t is the gross domestic savings measured at current prices in the US\$
- REER_t the real effective exchange rate (REER) is the weighted average of a country's currency relative to an index or basket of other major currencies, adjusted for the effects of inflation. It was measured in current US\$.
- β_0 is the constant term.
- $\beta_1, \beta_2, \beta_3,$ and $\beta_4,$ are the coefficients of the explanatory variables.

All data was accessed in 2018

For the variables included, the study expected that from literature, a well-coordinated real effective exchange rate produced better opportunities for investment in infrastructure (Neto & Lima, 2013). With regards to gross domestic savings, Singh (2011) showed that as a means of accelerating productivity and increasing infrastructure investment in India, there is need to promote the gross domestic savings.

3.5. Description of Variables

3.5.1. *Infrastructure Spending*

Construction value added was used as a proxy to measure infrastructure spending. This is because the indicator was not available in any on the data sources. Infrastructure spending is defined as capital investment expenditure, which in turn results in the presence of a tangible capital asset (TCA). According to the World Bank, 'value added in construction is defined as the value of output of the construction industry less the value of intermediate consumption.

3.5.2. *Total Debt Servicing*

The sum of interest and principal repayments paid in goods, currency or services on long-term debt, IMF repayments and short-term debt interest. The total debt service in summary refers to the percentage of exports of goods, primary income and services.

3.5.3. *Government Expenditure*

Government expenditure refers to outlays or government spending made with an aim to fulfill the obligation of the government. This expenditure is done either by disbursing cash or issuing a cheque.

There are different types of expenditure. Expenditure on recurrent items by the government is referred to as current expenditure while government capital expenditure is on investment items. These items could include but are not limited to roads, hospitals, equipment and schools.

3.5.4. *Government Savings*

It comprises savings public, private corporate and household sector.

Expressed as a percentage of the GDP, the gross domestic savings is GDP less consumption expenditure.

3.5.5. *Real Effective Exchange Rate*

The price of a currency in terms of another one is referred to as the exchange rate. The buying and selling of currencies is done in the foreign exchange market. The real effective exchange rate highlights the price level difference between trading partners. A sign of the evolution in a country's total external price competitiveness is provided by changes in real effective exchange rates.

3.6. **Data Collection Procedure**

Data was collected from the World Banks World Development Indicators (WDI) and Africa Banks African Development Indicators (AfDI) Database. The system is online based and as such the data was downloaded and saved in an excel data sheet. The data was thereafter cleaned by selecting the variables required for data analysis. The time frame was also selected from the online system.

3.7. **Research Population/ Data Sources**

Data was collected from the WDI and AfDI. The reason for sampling data from 1970-2014 was because data for all variables was available for this period. In addition, during this period Zambia had gone through three important phases; period of debt accumulation, period of debt cancellation and finally a period when the country has started to acquire more debt. The

dependent variable construction value added was used as a proxy variable for infrastructure spending and total debt service is the main variable of interest. The variables which include real effective exchange rate,

3.8. Data Processing and Analysis

The collected data was tabulated into E-views for processing and analysis and the following tests were conducted to ensure that the results obtained were valid and to ensure that the correct model was be used.

3.8.1. Unit Root Test

The main purpose for conducting unit root test is to check for stationarity properties, so as to ensure that the results derived from the regression models are not spurious (Nkoro & Uko, 2016). A time series is said to be stationary if its mean and variance are constant over time.

According to Engle and Granger (1987), a variable Y or series is said to be stationary if it is integrated of order d. In other words, if the non-stationarity hypothesis cannot be rejected the variables are differenced until they become stationary, to imply that the existence of a unit root is rejected. The Augmented Dickey Fuller test was used to test for stationarity. Following this test, it was appropriate to then proceed to test for cointegration.

3.8.2. Co-integration Analysis

Two variables are said to be co-integrated if they have a long-term or long-run equilibrium, relationship between them. If two or more variables, dependent and regressors are individually non-stationary but their combination is stationary, those variables are co-integrated on the long-run (Gujarati, 2004). The cointegration analysis was done using the Bounds test for co-integration.

Modeling time series in order to keep their long-run information intact can be done through cointegration. Granger (1981) and, Engle and Granger (1987) were the first to formalize the idea of cointegration, providing tests and estimation procedure to evaluate the existence of long-run relationship between set of variables within a dynamic specification framework. Cointegration involves a certain stationary linear combination of variables which are individually non-stationary but integrated to an order, I (d). Cointegration is an econometric concept that mimics the existence of a long-run equilibrium among underlying economic time series that converges over time. Because it brings together short and long-run variable information, cointegration is a strong basis for economic and statistical error correction model. All estimations are done using the student version of Eviews Econometric software.

3.9. Diagnostic Test Results

3.9.1. *Normality Test*

The assumption of normality is very important because the diagnostic tests depended on it. There are several ways of testing for normality in literature which includes the histogram of residuals, normal probability plot (NPP), a graphical residual and the Jarque-Bera test (Gujarati, 2004). To test for normality the Jarque-Bera method was used in this study.

3.9.2. *Test for Multicollinearity*

Multicollinearity occurs when there is a linear relationship between or among the explanatory variables. The main area of concern is that as multicollinearity increases, the standard errors for the coefficients can get inflated because their regression model estimates become unstable. This implies that in a collinear model, significant variables might appear insignificant. To test for the presence of multicollinearity the Klien's thumb rule and the pair-wise coefficients are the two methods which were employed in this study if multicollinearity were present.

3.9.3. *Heteroscedasticity*

Testing for Heteroscedasticity in the model was important because if the usual testing procedures were used despite heteroscedasticity, whatever inferences that may have been made may have been very misleading. Heteroscedasticity occurs when the variance of the error terms or residual is either increasing or decreasing (not constant). The presence of Heteroskedasticity leads to inefficiency estimators despite being linear, unbiased and consistent estimators. The white general heteroscedasticity test was used in this study as the sample size is large.

3.9.4. *Serial Correlation Test*

It is cardinal to test for serial correlation in a model, so as to establish whether the errors in the model are independently distributed. If they are not independently distributed it means that an error occurring at period may be carried over to the next period and the estimates won't be consistent. Using Durbin's alternative test for autocorrelation to check if there is correlation between members of the series or data in time series ordered in the time space. Thus, autocorrelation is said to be present if the successive error terms are inter-dependent. The null hypothesis implies that there is no serial correlation. No serial correlation means that the errors associated with one observation are not correlated with the errors of any other observation

3.9.5. *Model Specification Test*

For the results obtained to be valid in the regression analysis, the model used must be correctly specified. Model misspecification error occurs when one or more variables is either omitted

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from the model or included in the model. It is important to ensure that the model is correctly specified as it can affect the estimate of the regression coefficients.

To ensure that reliable results are obtained, the Ramsey reset test was used to test for model misspecification in this study

CHAPTER 4
PRESENTATION AND DISCUSSION OF FINDINGS

4.1.   Introduction

Chapter 4 empirically estimated the model developed in Chapter 3. Annual data for the period 1970-2014 was used. The study period and data source was chosen because annual figures are available for all the selected variables. The data that was used in this study is monitored and verified by the various institutions mentioned in this study.

In this Chapter, the time series data was examined to check for stationarity using the Augmented Dickey Fuller test. To find out the long-run and short-run estimate coefficients, a cointegration analysis and error correction model (ECM) was run. A comparison of the estimated long-run coefficients based on multivariate and univariate cointegration analysis was also done in this Chapter.

In Chapter 1, one hypothesis was provided for this study and this model estimation helps to test it. The hypothesis is provided once again:

a.   Increase in total debt service has a negative impact on Infrastructure spending

4.2.   Descriptive Statistics

Table 4.1 shows the descriptive statistics of the variables

Table 4. 1 Descriptive Statistics

Descriptive Statistics of the Variables						
Descriptive	CVA	TDS	REER	GOVT	GDS	DUMMY
Mean	10.71	10.50	2.13	10.96	11.01	0.56
Median	10.15	10.35	2	10.79	10.71	1
Maximum	10.63	10.41	2.44	10.59	9.81	1
Minimum	7.57	7.95	1.57	10.48	7.00	0
Std. Dev.	10.97	10.58	1.88	10.88	10.14	0.5

4.3.   Unit Root Test

Non-stationarity can lead to spurious regression results based on Autoregressive Distributed Lag estimation. The research must determine whether or not they are stationary before inferences are drawn. A variable order of integration of indicates the number of times that it

must be differenced in order to become stationary. A stationary time series is one who's mean; variance and autocorrelation are constant overtime.

This study utilized the Augmented Dickey Fuller (ADF) to test for stationarity and considered 5% significance level.

The null hypothesis implies that the data has a Unit Root and therefore non-stationary and the null hypothesis is rejected when the p-value is less than 0.05.

Table 4. 2 Unit Root Test Results at Level

Unit Root Results at Level					
Variable	Exogenous	ADF Test Statistic	ADF Critical values (5%)	P-value	Conclusion
Log(CVA)	Trend and intercept	-0.14	-3.53	0.99	Non-stationary
Log(TDS)	Trend and Intercept	-4.61	-3.53	0	Stationary
Log(REER)	Trend and Intercept	-0.87	-3.53	0.94	Non-Stationary
Log(GOVT)	Trend and Intercept	-0.99	-3.52	0.93	Non-Stationary
Log(GDS)	Trend and Intercept	-2.49	-3.53	0.33	Non-Stationary

Table 4.2 table shows that all the variables, in exception of Log (TDS) are stationary at level. Therefore, null hypothesis could not be rejected at level for the other variables at one percent, five percent and ten percent because the p value for all the other variables is greater than all conventional levels of significance.   Further, the test for stationarity at the first difference was done in Table 4.3.

Table 4. 3 Unit Root Test Results at First Difference

Unit Root Results at 1st Difference					
Variable	Exogenous	ADF Test Statistic	ADF Critical values (5%)	P-value	Conclusion
Log(CVA)	Trend and intercept	-6.39	-3.52	0	Stationary
Log(TDS)	Trend and Intercept	-9.49	-2.93	0	Stationary
Log(REER)	Trend and Intercept	-5.67	-3.52	0	Stationary
Log(GOVT)	Trend and Intercept	-6.39	-3.52	0	Stationary
Log(GDS)	Trend and Intercept	-7.12	-3.52	0	Stationary

Table 4.3 shows the summary on the stationarity tests on the variables. The table shows that at level only the Log (TDS) was stationary while at first difference all the variables were stationary. A glance at the p-values for all the variables shows that they are less than at least one of the conventional levels of significance. Therefore, this justified the use of the Auto Regressive Distributed Lag method of estimation since the order of integration differs among variables.

4.4.   Result Of Unit Root Tests

The test results of the Augmented Dickey-Fuller (ADF) statistic for four of the time series variables (REER, GOVT, CVA and GDS) used in the estimation were integrated of order one while TDS was integrated at level this implies that these where stationary at level while REER , GDS AND GOVT where stationary at first difference. The decision rule says to reject the null hypothesis when t* < ADF critical values which implied that mean data is stationary and therefore unit root does not exist.

4.5.   ARDL Estimate

ARDL model was used since all variables were integrated of order 1 (I (1)). This means that some variables were stationary at first difference while others were integrated at level. Using E-views 9, a lag selection of 3 was selected. Akaike Information Criteria (AIC) was employed to select the optimal number of lags in the model. Using Eviews 9, the study ran the ARDL Estimation Output. The results are shown in Table 4.4.

Table 4. 4 ARDL Estimation Output

ARDL Estimation output			
R- squared	0.99	Mean Dependent Var	5.22
Adjusted R-Squared	0.97	S.D Dependent Variable	9.35
S.E of Regression	1.61	Akaike info criterion	40.92
Sum Squared Resid	4.4	Schwarz criterion	41.92
Log Likelihood	-814.87	Hannan - Quinn Criter.	41.28
F- Statistic	57.97	Durbin- Watson Stat	2.15
Prob (F-Statistic)	0		

The ARDL Estimation results in Table 4.4 showed an Adjusted R-squared value of 0.97 which meant that approximately 97% of the variations in Construction Value Added (regressed) are

explained by Total Debt Servicing, Gross Domestic Savings, Government Expenditure, Real Effective Exchange Rate and Debt forgiveness and/reduction. The adjusted R-squared value also showed the overall goodness of fit of the model which lies between 0 and 1, but a more desirable value, is one that lies closer to 1, and the model is 0.97 which is desirable. Also, since R squared was less than the Durbin-Watson Statistics this confirmed that the model was not spurious. The probability (F- statistic) value was less than 0.05 which showed that the overall model was significant.

4.6. Cointegration Test

4.6.1. Bounds Test

The bounds test in eviews 9 was used to determine whether there is a long-run relationship between Construction Value Added and its independent variables. The null hypothesis states that there is no long-run relationship among the variables and if the F statistic is the greater than upper bound value (I1), the null hypothesis is rejected. This implied that there was cointegration among the set of (I (0) and I (1)). The result is inconclusive if computed F-statistic falls between lower bound I (0) and upper bound I (1). The results of the Bounds Test were shown in Table 4.5. The results showed that there was at least a long-run or short-run relation among these variables. This is because at all conventional level of significance, that is at1%, 5% and 10%, the F-statistic lies outside the bound range there by giving enough evidence to reject the null hypothesis and conclude that the variables are cointegrated. This gave the study freedom to estimate the cointegration equation co-efficient using the ECM and the short-run function.

Table 4. 5 Bounds Test

Bounds Test		
F-statistic	6.197504	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

4.6.2. Error Correction Model and Short Run Estimates

If the error correction approach is accurate, the coefficient of the lag of the CVA (dependent variable) should be between 0 and -1. The cointegration equation, in Table 4.6, showed that the variables do adjust back to equilibrium. This is because the coefficient of the cointegration

equation was -0.37 which lies between 0 and -1. The error correction coefficient is significant (with p<0.05) as shown in Table 4.6, which implied that there is a cointegrating relationship among the variables. This means that the variables move back to equilibrium in the long-run within one year. The speed of adjustment was shown by the number -0.37. In other words, the speed with which the total debt service, government expenditure, government savings and REER adjust from short-run disequilibrium to changes in construction value added in order to attain long-run equilibrium is 37.45% within one year.

Table 4.6 showed the results of the co-integration tests.

Table 4. 6 Short-run and ECM Results

Error Correction Mechanism Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(TDS)	-0.10	0.06	-1.68	0.10
DLOG(GOVT)	0.08	0.12	0.66	0.51
DLOG(REER)	-0.56	0.14	3.88	0
DLOG(GDS)	0.15	0.05	3.23	0
D(DUMMY)	0.20	0.23	-0.89	0.38
CointEq(-1)	-0.37	0.1	-3.86	0
CointEq = LOG(CVA) - (-0.52*LOG(TDS) + 0.21*LOG(GOVT) + 0.36				
*LOG(REER) + 0.74*LOG(GDS) + 1.73*DUMMY + 7.51)				

Furthermore, according to table 4.6, in the short-run, only gross domestic savings and the real effective exchange rate have an effect on construction value added as they have p<0.05.

4.6.3.   Long Run Estimates

Since it was established that cointegration exists among the variables in 4.6.1, long-run estimates of the variables were done. Table 4.7 shows the results of the long-run estimates. The coefficient of the total debt service is negative which shows that there is a negative relationship between TDS and CVA. The total debts service, gross domestic savings and the dummy variable (debt forgiveness/reduction) all had a p<0.05 and were therefore significant. There was evidence that they have an effect on the dependent variable. Table 4.7 shows the long run results.

Table 4. 7 Long run Results

Estimated Long-run Coefficients using ARDL approach dependent Variable is Ln (CVA$_t$)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.

Estimated Long-run Coefficients using ARDL approach dependent Variable is Ln (CVA_t)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TDS)	-0.52	0.21	-2.49	0.02
LOG(GOVT)	0.21	0.29	0.73	0.47
LOG(REER)	0.36	0.22	1.63	0.11
LOG(GDS)	0.74	0.19	3.89	0
DUMMY	1.73	0.27	6.35	0
C	7.51	5.34	1.40	0.17

A long-run relationship which has been established among the variables simply means that the variables tend to move together towards a steady state. In the event that there is a shock, the system has a tendency to adjust back. Interpretations of the rest of the coefficients were given under sub heading 4.7.

4.6.4. Hypothesis and Control Variables Test in Long-Run

The long-run coefficients of construction value added equation in this study with the multivariate and univariate cointegration tests are presented in Table 4.7. The hypothesis and the control variables were examined according to the estimated model in the long-run.

4.7.   Test Results

4.7.1.   Total Debt Service and Construction Value Added in Long-Run

According to the theoretical model, the total debt service was expected to have a negative influence on the construction value added over the long-run. Based on the estimation result above, the total debt service had a negative impact on expenditure on construction value added in the long-run. A 10% increase in the total debt service would reduce the expenditure on construction value added by 0.52% in the long-run.

4.7.2.   Gross Domestic Savings and Construction Value Added in Long-Run

The long-run estimated coefficient of Gross domestic savings was positive, had a $p < 0.05$ and therefore significant. A 10% increase in the gross domestic savings would increase the construction value added by 0.74% in the long-run.

4.7.3.   Real Effective Exchange Rate and Construction Value Added in Long-Run

Based on the estimation result a depreciation of the domestic currency leads to an increase in the construction value added by 0.36%. The results showed that the real effective exchange rate

had a positive impact on construction value added as expected. However, REER is not significant to explain the dependent variable CVA.

4.7.4. *Political Factors Specifically Debt Forgiveness or Reduction and Construction Value Added in Long-Run*

Following years prior and up to 2005 the Zambian economy experienced significant debt reduction or debt forgiveness when the country attained the HIPC completion point. The study included this control variable in the model to determine the effect of the debt cancellation on the dependent variable, construction value added. The estimated coefficients for the dummy variables were positive and had a $p<0.05$, indicating that the debt cancellation of 2005 had a positive effect on the construction value added in Zambia. A 10% increase in debt cancellation would increase expenditure on construction value added by 1.73% as expected in literature.

4.7.5. *Government Expenditure and Construction Value Added in Long-Run*

The long-run estimated coefficient of Government expenditure shows that it had a positive effect on construction value added it is not significant, as $p>0.05$. A 10% increase in government expenditure would increase expenditure by 0.21%.

4.8. Post Estimation Diagnostics

The long-run equation showed that Total Debt Service has negative effects on expenditure on Construction Value Added; this means in the long-run there is a negative relationship between Total debt servicing and the Construction Value Added. The other variables positively affected the Construction Value Added.

The other post estimation diagnostics showed that the model had no problems of Multi variance, Autocorrelation, Model Misspecification, and Serial Correlation. The model showed desirable properties.

4.9. Data Analysis and Interpretation

This chapter presents the results of the diagnostic tests that were conducted and their implications in this study. The tests include descriptive statistics, unit root, auto regressive distributed lags estimation, bounds test, normality, heteroscedasticity, autocorrelation and model specification.

4.9.1. *Normality Test*

The Jarque-Bera test of normality was done in order to establish whether the error term was normally distributed. This was important because an error term following a normal distribution is one of the conditions required for performing subsequent diagnostic tests. The results that were obtained are as shown in Figure 4.1; the null hypothesis states that residuals are normally distributed and the decision rule is that the null hypothesis is rejected if the p- value is less than 0.05. The results show that the p-value is 0.51 and it was therefore concluded that the residuals are normally distributed.
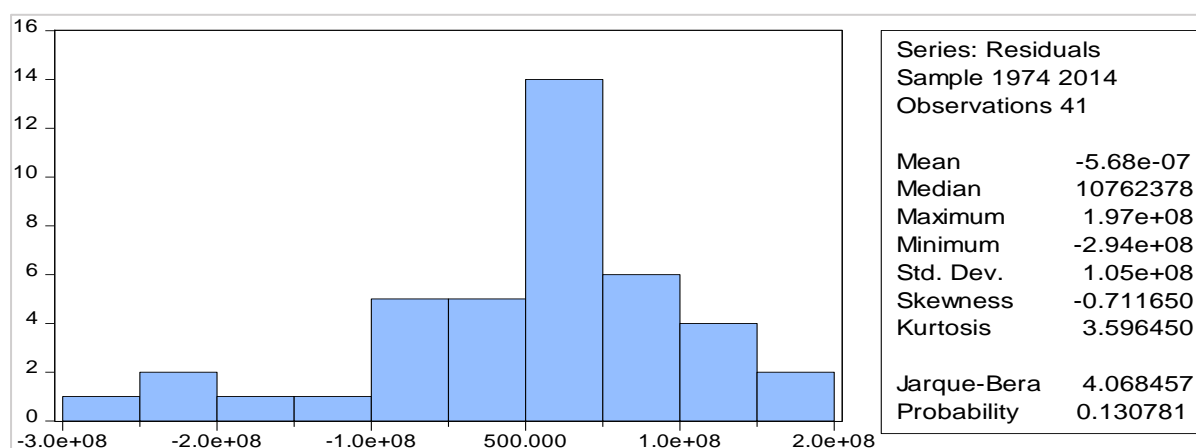
Figure 4. 1 Normality Test

4.9.2. *Heteroscedasticity*

The null hypothesis states that there is homoscedasticity when the p-value is greater than 0.05. The null hypothesis could not be rejected because the probability of the F-statistic is 0.8810 which is greater than 0.05. Therefore, there was homoscedasticity. This was a desirable property.

4.9.3. *Serial Correlation Test*

The null hypothesis states that the residuals are serially uncorrelated when the probability of the Chi-Square value of the Obs*R-squared is greater than 0.05. Using Eviews 9, the serial correlation test was done and Table 4.8 shows the results.

Table 4. 8 Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.15	Prob. F(1,28)	0.71
Obs*R-squared	0.38	Prob. Chi-Square(1)	0.54

From the results, there is a p-value of 0.54, the null hypothesis could not be rejected and it was concluded that the residuals are not serially correlated. This is because the p-value was greater than 0.05 at all conventional levels of significance. This was also a desirable property.

4.9.4.   Model Misspecification Test

The Ramsey Reset test was applied to test for Model specification after having conducted the diagnostic tests which showed that the variables are homoscedastic and serially uncorrelated with the error term. The null hypothesis states that the functional form of the model is correctly specified when F-statistic is greater than 0.05. Using Eviews 9 the model misspecification test was run and the results are shown in Table 4.9.

Table 4. 9 Model Misspecification Test

Omitted Variables: Squares of fitted values			
	Value	Df	Probability
t-statistic	1.21	28	0.24
F-statistic	1.47	(1, 28)	0.24

The F-statistic has a p-value of (0.24). Therefore, the null hypothesis of no omitted variables at all conventional levels of significance was accepted. Therefore, it was concluded that the model was correctly specified.

CHAPTER FIVE

CONCLUSION POLICY IMPLICATIONS AND RECOMMENDATIONS

5.1.   Introduction

There have been growing concerns over Zambia's rising debt and its implications on various sectors of the economy. The study analysed the relationship between infrastructure spending and total debt servicing using data from the World Banks World Development Indicators (WDI) and Africa Development Bank Indicators (AfDI). The aim of this study has been to achieve two specific objectives. First is to determine the effect of external debt servicing on public infrastructure spending in Zambia. Second, based on the findings, the study also drew policy implications. The study also examined that; how does construction value added respond to a change in total debt service and control variables such as real effective exchange rate, gross domestic savings, government expenditure and political factors?

Using economic and empirical analysis, the study showed the relationship between construction value added and this set of variables. The study provided some policy implications for the Zambian economy. This Chapter therefore discusses the empirical results, policy implications and provides suggestions for future study

5.2.   General Conclusions

This study investigated the effect of total debt service, government expenditure, gross domestic savings, real effective exchange rate and political factors on infrastructure expenditure in Zambia from 1970-2014 using cointegration and error correction mechanism approach (ECM). In this study, ARDL is used as basic method and also Johansen and Juselius (1990) maximum-likelihood cointegration tests are used as primary methods for the study of results. The estimated coefficients showed that that in the short-run, real effective exchange rates and gross domestic savings shaped construction value added in Zambia. In the long-run, the effect that total debt service, gross domestic savings and the dummy variable have on construction value added were statistically significant. From the long-run coefficient statistic, results showed that the total debt service had a negative effect on construction value added while government expenditure and real effective exchange rates didn't have significant impact on the construction value added in the long-run. The adjustment coefficient is low as per findings of the model.

5.3.   Policy Implications and Major Findings

In this study, ARDL method was used to estimate the model as was previously highlighted in the study. The estimated infrastructure spending equation has several features of importance:

i. The real effective exchange rate has a significant negative impact on construction value added in the short-run but it has no significant impact in the long-run.

ii. The total debt service has a significant negative impact on construction value added in the long-run. However, in the short-run the effect on construction value added is not significant.

iii. The gross domestic savings has a significant positive effect on construction value added in both the short-run and the long-run. However, its effect in the long-run it is more than its effect in the long-run.

iv. The government expenditure has a significant effect on construction value added in the long-run while its effect is not significant in the short-run.

v. The error correction term is as low as -0.37 which implies that annually thirty-seven (37) per cent of the divergence between the short-run construction value added level is eliminated from its long-run path.

vi. For the dummy variable, its estimated coefficients are positive and highly significant in both the short-run and the long-run showing that the debt cancellation highly impacted expenditure on infrastructure.

The focus of this section is mainly on the implications because the conduct of total debt servicing is a critical determinant of infrastructure spending in Zambia. From the results, there was a negative relationship between total debt service and infrastructure spending. From the empirical analysis, the study found that infrastructure spending contributes to the economic growth of a country; therefore it is important that the Zambian government continues to spend on the development of its infrastructure. However, at the rate at which the debt contraction has been done, it was the conviction of this study that the debt service charges cannot allow this type of expenditure to continue and this may most likely lead to an economic recession.

One of the ways to ensure infrastructure expenditure continues is to address challenges related to servicing of external debt.

On this basis, some policy implications are discussed.

i. Infrastructure development is a primary area of importance from a political and economic stand point. The study results indicated that it is negatively affected by external debt servicing. In order to minimize the effects of external debt servicing, policy managers should endeavour to ensure that the debt servicing burden should be

distributed evenly among different sectors of the economy. One way of ensuring this is achieved would be to facilitate a significant reduction in unwarranted expenditure, particularly on public administration. One such expenditure would be defence expenditure which could also be reduced considering Zambia's stable national security.

ii. In order to provide some relief with regards to debt obligations, the Zambian policy managers must negotiate with donor agencies to obtain loans that have lower interest rates and are more flexible with regards to duration, loan purpose, negotiation fees and moratorium commitments. Debt such as Eurobonds which were obtained in United States dollars and require bullet payments may not be favourable for this economy. Therefore, policy managers should negotiate with lenders to borrow external debt in the local currency in order to manage the foreign exchange risk. Depreciation of the local currency significantly increases the debt servicing costs.

iii. Due to the fact that Zambia has been classified as a Medium Income Country, is more difficult to access grants as compared to developing countries. Therefore, because the Country also relies on loans to finance its development agenda, policy makers must ensure that external loans are allocated efficiently to productive ends and are purpose-specific.

iv. In order to increase the capacity of local contractors in the infrastructure sector, foreign contractors that have been successful in obtaining infrastructure contracts are required by law to award twenty percent of the said contract to a Zambian contractor. However, the constitution dictates that foreign contractors are paid first. This inhibits the growth of local contractors. Therefore, the study recommends that policy makers must ensure flexibility in the management of local contractors as they can contribute significantly to the growth of the infrastructure sector.

v. Finally, the study found that by law, the Zambian constitution dictates that paying for external debt servicing takes precedence before all else in the national budget. Therefore, the infrastructure sector, like many others is not exempt from budget cuts when this is implemented. Therefore, to reduce dependence on foreign borrowing, the study recommends investment in infrastructure projects that may draw in more revenue into the country. One such example has been the introduction of toll gates on most newly constructed roads throughout the country. This type cost reflective initiative must be extended to other sectors such as health, education and water and sanitation to mention but a few. Cost reflective facilities provide relief by increasing a country's revenue which reduces its dependence on foreign borrowing. An example would be to

build specialist hospitals, education institutions and water and sanitation facilities that will not be subsidized by government but will instead increase the country's revenue. Resources obtained from these facilities will help conserve resources which can then be reassigned into more infrastructure development and propel the country's economy on a path of sustainable growth.

5.4.   Suggestions for Future Study

Using the model developed, the study suggests testing other variables to find which ones have optimal impact on infrastructure spending. The study also suggests a more in-depth study into how the country can make investment in public sector infrastructure profitable in order to use revenues obtained to enhance budget sustainability in the wake of this debt era.

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APPENDICES

Appendix 1 Tables

This appendix shows all the unit root tests done on all variables in chapter 4.

Unit Root Tests

Unit Root Test Results for construction value added

Null Hypothesis: CVA has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 3 (Automatic - based on AIC, max lag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-7.63	0
Test critical values:	1% level		-4.21	
	5% level		-3.53	
	10% level		-3.2	
*MacKinnon (1996) one-sided p-values.				

Conclusion: CVA is does not have a unit root. Reject the null hypothesis as p<0.05.

Therefore CVA is stationary at level.

Unit Root Test Results for total debt service

Null Hypothesis: TDS has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 3 (Automatic - based on AIC, max lag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-6.05	0
Test critical values:	1% level		-4.18	
	5% level		-3.53	
	10% level		-3.19	
*MacKinnon (1996) one-sided p-values.				

Conclusion: TDS is does not have a unit root. Reject the null hypothesis as p<0.05.

Therefore TDS is stationary at level.

Unit Root Test Results for gross domestic savings

Null Hypothesis: GDS has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 3 (Automatic - based on AIC, max lag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-0.63	1
Test critical values:	1% level		-4.18	
	5% level		-3.5	
	10% level		-3.17	
*MacKinnon (1996) one-sided p-values.				

Conclusion: GDS has a unit root. The null hypothesis could not be rejected as $p>0.05$. Therefore GDS is non-stationary at level. However, when tested at first difference the variable GDS is stationary at I (1).

Unit Root Test Results for real effective exchange rate

Null Hypothesis: REER has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 3 (Automatic - based on AIC, max lag =9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-0.87	0.95
Test critical values:	1% level		-4.23	
	5% level		-3.54	
	10% level		-3.20	
*MacKinnon (1996) one-sided p-values.				

In the same way, REER had a unit root at level. The null hypothesis could not be rejected as $p>0.05$. Therefore REER was non-stationary at level. However, when tested at first difference the variable REER was stationary at I (1).

Conclusion: REER had a unit root (it is non-stationary). The null hypothesis could not be rejected as $p>0.05$.

Unit Root Test Results for government expenditure

			t-Statistic	Prob.*
Null Hypothesis: LOG(GOVT) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 3 (Automatic - based on AIC, max lag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-0.99	0.93
Test critical values:	1% level		-4.18	
	5% level		-3.52	
	10% level		-3.19	
*MacKinnon (1996) one-sided p-values.				

Conclusion: GOVT had a unit root. The null hypothesis could not be rejected as p>0.05

Unit Root Test Results for gross domestic savings

			t-Statistic	Prob.*
Null Hypothesis: GDS has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 3 (Automatic - based on AIC, max lag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			3.69	1
Test critical values:	1% level		-4.23	
	5% level		-3.54	
	10% level		-3.2	
*MacKinnon (1996) one-sided p-values.				

Conclusion: GDS had a unit root. The null hypothesis could not be rejected as p>0.05

Heteroscedasticity

Heteroscedasticity Test: White

Heteroscedasticity Test: White			
F-statistic	2	Prob. F(10,29)	0.88
Obs*R-squared	16.33	Prob. Chi-Square(10)	0.09
Scaled explained SS	6.94	Prob. Chi-Square(10)	0.73

Significant F-statistic showing homoscedasticity

Appendix 2 Journal Submission Status

Your submission entitled: The Effects of External Debt Servicing on Infrastructure Spending:

A Case of Zambia

Journal submitted to**:** International Journal of Construction Management

Mwila Kapindula mwilakapindula@gmail.com | Jun 15, 2018, 2:51 PM | to Vivian Tam V.Tam@westernsydney.edu.au

Greetings,

I have not heard back from anyone regarding my journal submission.

Kindly assist with feedback.

Regards,

Mwila Grace

Vivian Tam V.Tam@westernsydney.edu.au | Jun 16, 2018, 3:33 AM | mwilakapindula@gmail.com

Dear Mwila,

The paper is currently under review. You will notify the results in due course. Please use **TJCM-2018-0088** for future communication

Cheers

Vivian