INVESTIGATING THRESHOLD EFFECTS OF PUBLIC DEBT ON ECONOMIC GROWTH FOR ZAMBIA (1980 - 2015)

BY

CHIMUKA HAKALIMA MATONGO

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DECLARATION

I, **Chimuka Hakalima Matongo**, do declare that this dissertation represents my own work and that it has not previously been and will not be presented to this or any other University for a similar or any other degree award.

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APPROVAL

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ABSTRACT

Debt overhang theory suggests that debt has a Laffer curve type of relationship with economic growth. This implies that there is a threshold value of debt, beyond which, debt accumulation will negatively affect economic growth. This paper sought to contribute to existing literature by investigating the existence of a Laffer curve relationship between debt and economic growth in Zambia. Unlike other studies, this study focuses on estimating the optimal growth maximizing public debt threshold for Zambia and not only investigating the existence of a relationship between these variables. . This study employs the approach used by Mupungu and Le Roux (2015) who considered the threshold effect of public debt on economic growth in Zimbabwe by estimating a bivariate quadratic model and a multivariate model to control for model specification. The study additionally employs the Threshold Autoregressive (TAR) model to validate results from the optimization approach. The paper finds evidence of the existence of a Laffer curve relationship by plotting the predicted values of GDP from the bivariate model against debt-to-GDP ratio. The tipping point is found to be at 36.6 percent of debt-to-GDP ratio after maximizing the resultant equation of the model. The multivariate threshold autoregressive model reveals that for the Zambian case, debt has an insignificant effect on growth below 28.4 Percent of GDP and a significant negative effect once it goes beyond 44.9 percent of GDP. This means that the 36.6 percent threshold value from maximizing the bivariate model is confirmed by the TAR model. Since the Threshold model found that there is no significant relationship between debt and GDP before the tipping point, Zambia should ensure that debt financing below the optimal threshold is used for growth enhancing activities and not financing government non-capital expenditures.

Keywords: Public-debt, growth maximising, Laffer curve, Threshold Autoregressive

DEDICATION

I dedicate this research to my family and friends for their immeasurable, consistent and unwavering encouragement throughout my studies.

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ABBREVIATIONS AND ACRONYMS

BOZ	Bank of Zambia
CPIA	Country Performance Indicator Assessment
DC	Developed Country
DSA	Debt Sustainability Analysis
GDP	Gross Domestic Product
GNP	Gross National Product
GRZ	Government of the Republic of Zambia
HIPC	Highly Indebted Poor Countries
IMF	International Monetary Fund
LDC	Less Developed Countries
LICs	Low Income Countries
MDG's	Millennium Development Goals
MDRI	Multilateral Debt Relief Initiative
NDP	National Development Plan
NPV	Net Present Value
OLS	Ordinary Least Squares
SSA	Sub-Saharan African
UNCTAD	United Nations Conference on Trade and Development
US$	United States Dollar
MOF	Ministry of Finance
TAR	Threshold Autoregressive
WB	World Bank
ADF	Augmented Dickey Fuller
ZIPAR	Zambia Institute for Policy Analysis and Research
AFRODAD	African Forum and Network on Debt and Development

UNDP	United Nations Development Plan
INDECO	Industrial Development Corporation
FINDECO	Finance and Development Corporation
NERP	New Economic Recovery Programme
EIU	Economist Intelligence Unit
ZPA	Zambian Privatisation Agency
BOP	Balance of Payment
IDA	International Development Agency (IDA)
IFAD	International Fund for Agriculture Development
EIB	European Investment Bank
OPEC	Organization of the Petroleum Exporting Countries
UNCTAD	United Nations Conference on Trade and Development

CHAPTER ONE: INTRODUCTION

1.1 Background Information

The chase for economic development has always been at the hub of human civilization (Chizonde, 2016). Meanwhile Public debt is considered to be one of the key drivers of economic growth which ultimately enhances economic development. The introductory chapter of this paper contains six sections: section 1.1 presents background information on Zambia's Public debt and economic growth situation. Based on the background, section 1.2 documents the problem statement and the objectives of the study are highlighted in section 1.3. This Chapter also states the significance of the study in section 1.4 and its organization in section 1.5 before making a conclusion in section 1.6.

1.1.1 Zambia's public debt and Economic Growth

For the ten years up to 2014, Zambia had one of the world's fastest growing economies, with real GDP growth averaging roughly 6.7% per annum (Nalishebo & Banda, 2018). However, economic growth slowed in 2015 and 2016 to just below 3%, due to falling copper prices, reduced power generation, and depreciation of the kwacha (Daka, Kapena, & Fandamu, 2017). Zambia's lack of economic diversification and dependency on copper as its sole major export makes it vulnerable to fluctuations in the world commodities market. When copper prices turned downward in 2015 due to declining demand from China, the Zambian economy was adversely affected (World Bank Group, 2017).

Despite the past economic growth and its status as a lower middle-income country, Zambia's widespread and extreme rural poverty and high unemployment levels remain significant problems, made worse by a high birth rate, a relatively high HIV/AIDS burden, and by market-distorting agricultural and energy policies. Zambia has raised $7 billion from international investors by issuing separate sovereign bonds in 2012, 2014, and 2015, significantly increasing the country's public debt burden to 56% of GDP. The Zambia government planned to refinance $2.8 billion worth of Eurobonds in 2017 to cut debt servicing costs (Nalishebo & Banda, 2018). Zambia's currency, the kwacha, also depreciated sharply against the dollar through 2015-16, leading the central bank to restrict lending. Infrastructure spending in recent years has increased the fiscal deficit-over 8% in 2015-and

may encourage the government to seek external financing from the IMF to fund the shortfall (World Bank Group, 2017).

The Gross Domestic Product (GDP) expanded by 4.10% in 2017 from the previous year. GDP Annual Growth Rate averaged 2.97% from 1961 until 2017, reaching an all-time high of 16.65% in 1965 and a record low of -8.63 %in 1994. (Bank of Zambia, 2017).The figure below shows Zambia's economic growth from 1961 to 2017.

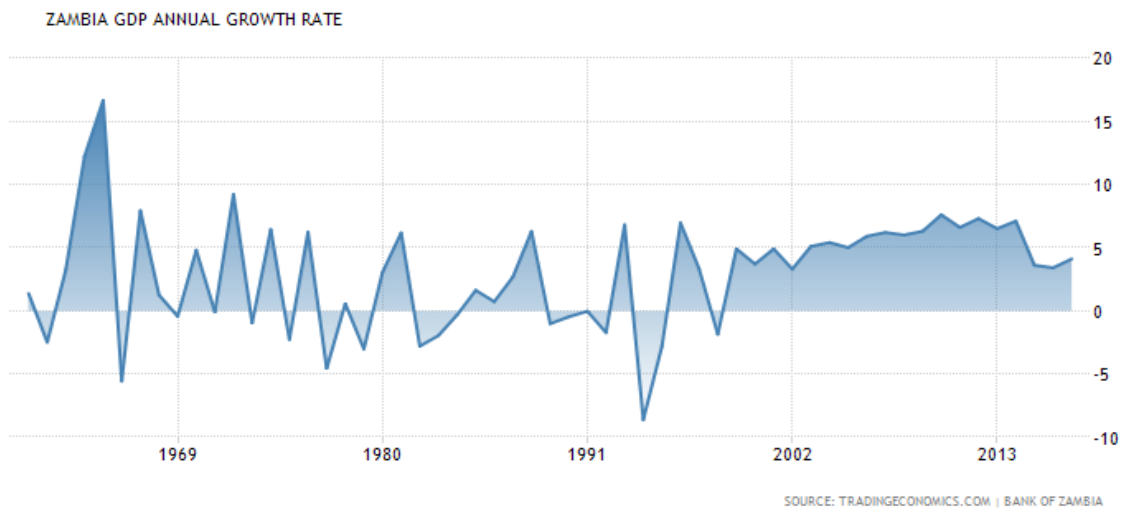


Figure 1 Zambia GDP Growth Rate, 1961 to 2017

Economic growth is largely held to be the key to development and poverty eradication (Daka, et al., 2017). Consequently, governments across the world set out ambitious targets to grow their national economies. These targets usually require government spending to be well above their revenue collection capacity, thereby causing fiscal deficits. In order to close up these deficits, such governments seek to contract public debt through both domestic and foreign loans (World Bank Group, 2017). While it has helped evolve various economies, debt is seen to be problematic in others, especially developing countries. Lately there has been an increase in empirical evidence regarding the effects of public debt on economic growth.

Some studies in the field of macroeconomics have focused on the relationship between economic growth and public debt. Of these, some have sought to assess whether there is indeed a positive or negative relationship between public debt and economic growth. A few more studies have attempted to evaluate the non-linearity of this relationship following the general consensus that increases in public debt enhance economic growth up to a certain level, beyond which, further increases become a drag on economic growth (Reinhart &

Rogoff, 2010). The understanding is that at low levels, debt can enhance economic growth by providing much-needed capital. However, further increases beyond a certain point lead to lower and possibly negative growth rates (Mupunga & le Roux, 2015).

1.2 Problem Statement

Despite having a number of empirical studies undertaken in the area of public debt and economic growth showing that, for various countries, in the long run and beyond a certain threshold, public debt would negatively influence economic growth, very little work has been done to establish the country specific levels of public debt beyond which more borrowing by those countries becomes a drag to economic growth (See Mupunga and Roux, 2015, Hemantha, Kumara and Cooray, 2013, Tuffour and Joseph, 2012).

In Zambia, researchers have compiled public debt data, either as an end goal or to address specific research questions (See UNDP, 2015, AFRODAB 2014, AFRODAB, 2015, World Bank, 2017). Notable are the studies about the impact of public debt on economic growth (Chongo 2015, and kapena et al 2017). This state of affair indicates that there is still need to resolve the problem of a growth maximizing public debt threshold specific to Zambia. The available public debt thresholds of 60% of GDP for many low income countries calibrated by the IMF is mainly meant to determine borrowing limits from the IMF and other concessional funds. This limit seeks to prevent the build-up of unsustainable debt without much concern about the prospects of economic growth in Zambia. When cross-sectional error dependence is accounted for, authors are usually unable to find a universally applicable threshold effect, thereby, justifying the need for country specific threshold values (Chudik, Mohaddes, Paseran, & Raissi, 2015).

Against this backdrop, this paper poses one main question: What is the optimal growth maximizing public debt threshold for Zambia?

1.3 Objectives of the Study

The broad objective of this study is to investigate the threshold effect of public debt on economic growth in Zambia.

1.3.1 Specific Objectives

To achieve the broad objective, the study seeks to analyse the Zambian case using the following specific objectives:

i. To investigate the existence of a Laffer curve type of relationship between public debt and economic growth in Zambia.
ii. To estimate the level beyond which public debt impairs economic growth in Zambia.

1.4 Significance of the Study

Public Debt is an important source of development finance and a key tool for eradicating poverty. Countries all over the world borrow to finance their investment and development (World Bank Group, 2017). Zambia is no different. The government of Zambia needs more finances to meet the seemingly huge and immediate needs of various kinds, including that of infrastructure improvement and expansion. However, debt needs to be managed carefully and the proceeds of borrowing, wisely invested. There has recently been an increasing amount of discussion about Zambia's debt levels. A little over 10 years after a huge debt relief effort, the rapid accumulation of debt has once again put Zambia in the spotlight. Total public sector and publicly guaranteed debt was recorded at 59% of GDP at the end of 2017, up from 32% in 2014 (Nalishebo & Banda, 2018).

This study is an attempt to add to the body of knowledge by estimating the optimum debt level in view of recent data which will help to determine the level above which public debt will have negative effects on the economy and to assess whether a country's current borrowing strategy may lead to future debt-servicing difficulties. Also, the outcome of this research and policy recommendation will be beneficial to individuals and to the government as it will inform government policies and ensure the smooth running of the economy.

1.5 Organisation of the Study

This research comprises six main chapters. Chapter two documents a detailed overview of Zambia's economic performance and evolution of public debt since 1964. An investigative review of critical literature relating to growth maximising public debt threshold levels is presented in section three. The literature review flows in three parts that include definition of key concepts. Chapter four describes the methodology employed in the study while chapter five is dedicated to the analysis of empirical results and interpretations. Finally, a summary of the research findings with corresponding conclusions and policy implications is offered in Chapter six.

1.6 Conclusion

Like many other low-income countries, Zambia's heavy indebtedness is a result of a complex interrelationship of political, economic and social factors. The increasing public debt is linked to domestic pressures and policy failures such as the public sector's huge desire to borrow to finance developmental programs and to address seemingly temporal external shocks. With these shocks, the environment for public debt management in Zambia has been changing, and will continue to change in the coming years. It is expected that, the rising public debt stock is yet to impose a serious problem of debt overhang. If the situation is not curbed, the increase in public debt service which is exacerbated by huge accumulation of the stock of debt will ultimately result in increased budget deficit. To finance the deficit, Government will have to borrow from external and domestic sources, creating a virtuous cycle of indebtedness. It is, therefore important to ensure the growth maximising levels of public debt are taken note of and caution is exercised in the management and accumulation of public debt

CHAPTER TWO:

OVERVIEW OF ECONOMIC PERFORMANCE AND EVOLUTION OF DEBT IN ZAMBIA

2.1 Introduction

This chapter presents an overview of Zambia's economic performance and the evolution of the both external and domestic debt. The chapter is divided into four sections: section 2.2 presents the background of Zambia's economic performance, section 2.3 outlines the episodes of Zambia economic performance from 1964 to date, while section 2.4 documents the evolution of public debt in Zambia. Finally, a conclusion is drawn in section 2.5.

2.2 Background of Zambia's Economic Performance

The Zambian economy has experienced dramatic changes overtime from as far back as independence. In 1964, Zambia was comparatively a rich country with the 4th highest GDP per capita in Africa (Whitworth, 2013). The years of economic growth were mainly due to high prices of copper on the international commodity market. The government enjoyed considerable fiscal resources, leading to a fast growth in social infrastructure. The fast growth in the early days, averaging 6%, distinguished Zambia from other colonies and earned it a middle income classification from the World Bank (Chileshe & Longa, undated).

As a colony, Zambia was part of the central African federation which included Nyasaland (Malawi) and Southern Rhodesia (Zimbabwe). From the outset, the benefits of the federation were very evenly distributed even though industry and infrastructure were concentrated in Zimbabwe (IBRD, 1998). Zambia inherited much less at independence in terms of infrastructure and industry; the inheritance comprised a thriving copper mining industry-among other key infrastructural projects. Zambia inherited a railway network, a hydroelectricity generation plant at Kariba Dum and a handful of industries that included breweries, maize milling and cement production (Whitworth, 2013).

There were several other substantial advantages relative to other former colonies. With the richest mineral deposits in the continent and being the 4th largest copper producer in the world, Zambia bought back the mineral rights and royalties which the British South African Company had owned since 1891(IBRD, 1998). This development meant that taxation of the copper industries would no longer be siphoned off by the Federation, making the government

expectant of substantial streams of fiscal revenue. Copper contributed 93% of exports and 71% of government revenue which was equivalent to 18.5% of GDP in 1965 and more than half of government revenue every year until 1971. Other than minerals, Zambia had substantial land resources; 39 million hectors, 58% of which was classified as having medium to high potential for agricultural production (Whitworth, 2013).

The Country also had an excellent climate for agriculture and abundant water resources valuable for both agriculture and hydro-electricity generation. With the Victoria Falls and some of the best game reserves in southern Africa, there was considerable potential for tourism. Finally, for much of the period after independence, Zambia has been a peaceful and politically favourable country. The transfers of power had been entirely peaceful. Arguably, with its natural resources and good fiscal prospects, Zambia started life with great potential (Whitworth, 2012).

On the down side, upon independence, Zambia had to herself a small number of educated citizens relative to other colonies. In 1963, there were fewer than 100 Zambian University graduates and less than 1000 secondary school graduates. Ultimately, the lack of skilled and educated Human resource at various levels was probably the greatest single constraint on Zambia's development in the early years (Snelson, 1990).

The Geography of the country also constrained economic growth prospects at independence (Chileshe & Longa, undated). Being a large, sparsely populated country meant that providing social infrastructure such as health, education and roads would inevitably be relatively more expensive per person. Its small population and domestic market, on the other hand, meant that there was limited scope for manufacturing unless the economy was opened up to access export markets. Additionally, prospects were further limited by being land locked and having poor transport links with all neighbours except Southern Rhodesia, today's Zimbabwe (Whitworth, 2013).

2.3 Episodes of Zambia's macroeconomic performance.

The Macro-economic performance of the Zambian economy can be sub-divided into five key periods. The performance of the economy in each of these episodes can further be linked to some key local and international policy changes and external shocks.

A: Independence to the 1970s: Drive towards Nationalization

In the early years, after attaining independence, the overall objective of the Zambian government was to diversify production to avoid complete dependency on any single

commodity. The government encouraged development of new industries and a radical improvement in agriculture. The aim was to quickly improve social investment in education, health, service, roads and other social amenities (WorldBank, 1977). Further, Zambia instituted a program of national development plans, under the direction of the National Commission for Development Planning: the Transitional Development Plan (1964–66) was followed by the First National Development Plan (1966–71). These two plans were deemed successful, and they provided for the implementation of major investments in infrastructure and manufacturing (Whitworth, 2012).

A sudden change in the structure of Zambia's economy came with the Mulungushi Reforms of April 1968, when the government switched to a more restrictive policy environment, with a heavy role for the state in national development (Chileshe & Longa, undated). The government declared its intention to acquire equity holdings, usually 51% or more, in a number of key foreign-owned firms, to be controlled by a parastatal conglomerate named the Industrial Development Corporation (INDECO). The Finance and Development Corporation (FINDECO) on the other hand allowed the Zambian government to gain control of insurance companies and building societies. However, foreign-owned banks such as Barclays, Standard Chartered and Grindlays successfully resisted takeover (Whitworth, 2012).

A decade after Independence, the Zambian economic landscape had been completely transformed. The industrial sector had expanded enormously but driven by the state and not the private sector. In 1975 the Zambia Industrial and Mining Corporation (ZIMCO), the giant state-owned parent holding company embracing some 73 state controlled subsidiaries, reported a turnover of K 1.2 billion [US$1.8 billion], total net assets of K 1.5 billion [US$2.3 billion, of which the mines accounted for about 80%], total employment of over 100,000 persons or close to 25% of total national wage employment. Including an additional 14 major statutory bodies and corporations, it is estimated that well over half of Gross Domestic Product per year originated from the parastatal sector and that parastatals together employ at least a third of total national formal employment (WorldBank, 1977).

B: 1970s to 1991: External Shocks and the contraction of Public Debt

After 1975, Zambia faced falling copper prices, political turmoil in neighbouring countries and severe effects of the first oil shock. To cover up for the shortfalls in revenue, the government borrowed heavily from the international markets and Bretton-wood institutions (Chileshe & Longa, undated). By the early 1980s, it was clear that the 1970s reforms had failed. Consequently, by the mid-1980s Zambia was one of the most indebted nations in the

world, relative to its gross domestic product (GDP). It is this indebtedness which drove the Zambian government to attempting the implementation of a very stringent IMF/World Bank Structural Adjustment Programme (SAP) (Whitworth, 2012).

The IMF was insisting that the Zambian government should introduce programs aimed at stabilizing the economy and restructuring it to reduce dependence on copper. The proposed measures included: the ending of price controls; devaluation of the Zambian kwacha, cut-backs in government expenditure; cancellation of subsidies on food and fertilizer; and increased prices for farm produce. The removal of food subsidies caused massive increases in the prices of basic foodstuffs; the country's mostly urbanized population rioted in protest (Chileshe & Longa, undated). In desperation, government abandoned the IMF program in 1987 and introduced a New Economic Recovery Programme meant to re-impose the controls of the 1970s. Despite this new economic intervention, the economy continued declining, poverty levels increased and debt swelled to about US$7.1 billion by 1991. Eventually the UNIP government moved toward a new understanding with the IMF in 1989. Time, however, was running out for the UNIP government. There was a call for multiparty elections, which they eventually lost to the Movement for Multiparty Democracy (MMD)(Whitworth, 2013).

C: 1991 to 1999: Multi-party democracy and Liberalization

In 1991, the UNIP era ended. The Movement for Multiparty Democracy (MMD) took over government with a strong mandate to reform the Zambian economy. With inflation exceeding 100% and GDP declining, in 1992, the government settled for a comprehensive reform programme with the IMF and World Bank while aiming at stabilising and restructuring the economy and also to stimulate growth (World Bank, 2004). The main reforms are summarised below:

Fiscal and Monetary policy: In 1993 the government introduced a cash budget system to strengthen budgetary control expenditure. In 1994 the Zambia Revenue Authority was established to strengthen revenue collection and in 1995 Value Added Tax replaced the cumbersome sales tax (UNDP, 2015). With the abolition of most consumer and producer subsidies and with increasing aid, the fiscal deficit after grants started to decline from 1995 averaging 4.9% of GDP between 1995 and 2000 (Whitworth, 2013). In 1993 the Bank of Zambia removed all restrictions on bank lending and deposit rates and allowed official interest rates to be determined by the market at the weekly Treasury bill auction (McPherson, 2004). The usefulness of the market based monetary instruments was, however, hampered by

the shallow financial market in Zambia. The commercial banks were simply unwilling to participate in the new system. The main instruments of monetary control have been statutory reserve requirements and liquid asset requirements (Chileshe & Longa, undated).

Exchange Rate: In 1992 the Government allowed the exchange rate and the allocation of foreign exchange to be determined by the market through bureaux de change (Whitworth, 2013). While Transactions took place at the commercial banks at a rate determined by the 'bureaux de change', The Bank of Zambia has always played a monitoring role. By 1993 most foreign exchange controls had been removed and by 1994, when the Kwacha became fully convertible, the foreign exchange market was completely decontrolled.

Agricultural and Trade liberalisation: Subsidies of maize-meal and fertilisers were eliminated in 1992. The government went on to decontrol maize producer prices and withdrew from marketing agricultural inputs (Whitworth, 2013). The government also embarked on a radical programme of trade and industrial policy reform, eliminating all licensing and quantitative restrictions on imports and exports over a five year period. Tariffs were reduced and the tariff structure simplified. The effect of these reforms was to transform Zambia's trade regime from one of the most protectionist in Africa to one of the most liberal (Chileshe & Longa, undated).

Privatisation: A privatisation act was passed in 1992, and the Zambian Privatisation Agency (ZPA) was created to convert parastatals to private ownership. This was done to attract investment so as to enable potentially profitable companies to survive. In many respects ZPA was highly successful (Whitworth, 2013). By March 2000, 113 enterprises out of the original portfolio of 144 had been privatised. Although 38 parastatals had been forced into liquidation before the privatisation programme began, the vast majority survived (ibid). While employment in non-mining parastatals fell from about 28,000 before privatisation to an estimated 20,000 four years later, this was inevitable; most parastatals had bloated staffing levels and significant reductions were necessary for competitiveness and to stay in business. Meanwhile, the need to be able to trade shares led to the establishment of the Lusaka Stock Exchange as part of the programme (Chileshe & Longa, undated).

D: 2000 to 2011: Sustained Positive growth and Debt Cancellation

Following the privatisation of mines, there was a turning point in the Zambian economy as both the mining industry and the economy generally experienced a virtuous cycle of growth

(Chileshe & Longa, undated). Zambia experienced an unprecedented period of sustained real GDP growth-averaging 5.2% per annum or 2.6% per annum in per capita terms, between 1999 and 2011(ibid). Booming copper exports quickly eliminated the balance of payments deficit from -13% of GDP in 2003 to a surplus of 8.3% in 2006 and facilitated the replenishment of foreign exchange reserves (WorldBank, 2002).

E: 2011 to 2016: Contraction of New Debt and reduced growth

The basic economic challenge that faced the Patriotic Front (PF) administration upon taking over office in 2011 was to ensure that macro-economic stability and rapid growth benefited the entire population, through employment creation and improved service delivery. The combination of macroeconomic stability and healthy investment in mining meant that robust GDP growth was likely to continue. Following the issuance of Zambia‘s first sovereign credit ratings, and with the completion of its IMF programme, which restricted commercial borrowing, in 2011, a completely new opportunity presented itself -issuing sovereign bonds. With bond yields in developed economies at historic lows, Zambia was able to take advantage of increased interest in emerging markets to issue its first Eurobond for US$ 750 million in September 2012. Despite a low yield of 5.625%, the issue was fourteen times oversubscribed, a striking indication both of the transformation in Zambia‘s reputation in financial markets and the scale of its borrowing capacity (Whitworth, 2013).

2.4 Public Debt in Zambia

Like other low-income countries (LICs), Zambia’s heavy indebtedness is as a result of both domestic policy failings, and exogenous factors beyond government control. As it was fashionable then, Zambia borrowed heavily in the 1970s and early 1980s for development purposes. This was also meant to close the gap in the current account deficits in the Balance of Payment (BOP) but with very little success (Chileshe & Longa, undated). It has been argued that some of these borrowings were wasted on ‘white elephant’ projects such as the Chipata-Muchinji rail that never took off or the Mwinilunga Pineapple Cannery that failed to make a mark at the world commodity market (Whitworth, 2012). However, most of the borrowings were prudently invested in human, physical and social infrastructure and water reticulation systems (AFRODAD, 2015).

Zambia’s heavy indebtedness can also be attributed to political factors. During the latter part of the 1970s and early 1980s, Zambia actively supported liberation struggles such as the ANC in South Africa and the ZANU-PF in Zimbabwe that were waging war against the racist

regimes in the Southern region. It is estimated that Zambia incurred a total debt of US$5.3 billion in opposing the Apartheid system of governance (AFRODAD, 2015).

A: Evolution of External Debt

External debt in Zambia has evolved from a position of huge external debt overhang in the 1980s, which constrained the governments' abilities to effectively plan and implement national plans, to more sustainable levels in recent years, as indicated by the country's external debt indicators as of 2013 (AFRODAD, 2015). It is estimated that in 1986, Zambia spent approximately 86% of its export earnings on debt service and was left with only 14% to distribute to other sectors of the economy. This trend continued even with the onset of Highly Indebted Poor Countries (HIPC) when in 1999 Zambia paid over three times of its combined budget for health, education and social security in debt service. As at the end of 2000, the country's external debt to exports and external debt to gross national income (GNI) stood at 652% and 188.6% respectively(ibid).

With the attainment of the HIPC Completion Point (HIPC-CP) in April 2005, there was debt cancellation by both bilateral and multilateral creditors, resulting in a 36.2% reduction in the country's external debt from US$7,080million as of 2004 to USS$4,519.3million as of 2005. Consequently, the country's external debt to GDP ratio declined to 63% as at end 2005 from 130.2% as of 2004 (UNDP, 2014). A further qualification for debt relief under the Multilateral Debt Relief Initiative (MDRI) which began in 2006 following the July 2005 proposal by the G-8 that the International Monetary Fund (IMF), World Bank (WB) and the African Development Fund (AfDF) should cancel 100% of their debt claims on HIPC countries in order to free up additional resources for these countries to advance towards meeting the United Nations Millennium Development Goals (MDGs) (Daka, et al., 2017).

The country also received debt relief under the MDRI in 2006 which resulted in a 77.9% reduction in its total outstanding external debt between 2005 and 2006. Consequently, external debt to GDP declined to 9.3% of GDP as of end 2006. As a proportion of total public debt, external debt also declined to approximately 31% as of end 2006 from 65.7% as of end 2005. Among others, debt relief included:

- The International Development Agency (IDA), AfDF who cancelled 100% of debts contracted prior to December 2003 and December 2004 amounting to US$1,813million and US$300.6million respectively;

- The International Fund for Agriculture Development (IFAD), the Arab Bank for Economic Development in Africa (BADEA), the European Investment Bank (EIB) and the Organization of the Petroleum Exporting Countries (OPEC) Fund for International Development who provided debt relief amounting to US$729.6million; and
- Non-Paris Club countries also provided debt reduction on Paris Club comparable terms with China providing partial cancellation of interest free loans that matured in 2005 amounting to US$11.3million

In 2006, the government acquired six new loans on concessional terms, estimated at approximately US$79.7miilion so as to finance its various activities such as public service management reforms, investment in the water sector, smallholder livestock investment and the TAZARA protocol. More loans were also acquired on concessional terms in 2007 to fund targeted priority areas identified in the country's Fifth National Development Plan (2006-2010) such as road rehabilitation, poverty reduction budget support, water supply and sanitation and the copper belt feeder road rehabilitation project among others. Export credits also increased by 80.8% mainly from the Mulungushi Textiles Limited Project debt that the government took over during the same year for the non-performing portfolio of the Development Bank of Zambia (AFRODAD, 2015).

Even though the government continued with external borrowing, it is notable that up to the end of 2011, the total external debt remained below US$ 2 billion and was mainly composed of concessionary sources. However, external debt increased by 61% between 2011 and 2012,

to reach approximately US$3.2billion as of end 2012. The major contributing factor to the rise in external debt stock during that year was the country's issuance of a debut 10 year US$750 million Eurobond on the international capital market in September 2012. The Eurobond funds were envisaged to be spent on infrastructure projects that promote growth (Daka, et al., 2017).

B: Evolution of Domestic debt

The build-up of domestic debt is not a new occurrence in the Zambian economy. The history of borrowing domestically in Zambia is possibly as long as its post-independence economic history (AFRODAD, 2015). However, owing partly to the enormity of the external debt component until recently and for a long time, domestic debt issues were ignored in Zambia. The country did not have a formal domestic debt statement until 2003 (Chongo, 2015). An analysis of the domestic debt developments shows that the domestic debt stock which stood

at K5 498.81million as at the end of 2004 increased by 259% to reach K19 744.57 million in December 2013. The stock of debt in the first category increased as a result of the government issuing various debt instruments for the achievement of both fiscal and monetary policy objectives and also for the development of the secondary market respectively. In the second category, with the exception of pension arrears whose stock increased between 2011 and 2013, the government had made efforts to reduce the stock of domestic arrears to road contractors and suppliers of goods and services for instance. Consequently, there was an overall decline in the stock of total outstanding arrears during the same period (AFRODAD, 2015).

Regardless of the above mentioned 259% nominal increase in the country's total outstanding public domestic debt, it is noteworthy that as a percentage of GDP, it has actually declined from a high of 25.9% as of end 2005 to 13.6% as of end 2012. This implies that the burden of domestic debt on the economy has been declining as GDP has been growing at a much faster rate. Before the country received external debt relief under the HIPC/MDRI in 2006, domestic debt was less dominant than external debt, averaging approximately 34.3% of the total outstanding public debt as of end 2005. However, following the 79% decline in the country's external debt stock in 2006, domestic debt as a proportion of total public debt increased.

Generally, public debt as a percentage of GDP is used by investors to measure a country's ability to make future payments on its debt (Mupunga & Le Roux, 2015). Figure 2 depicts the relationship between economic growth and public debt in Zambia over the period 1980 to 2015.

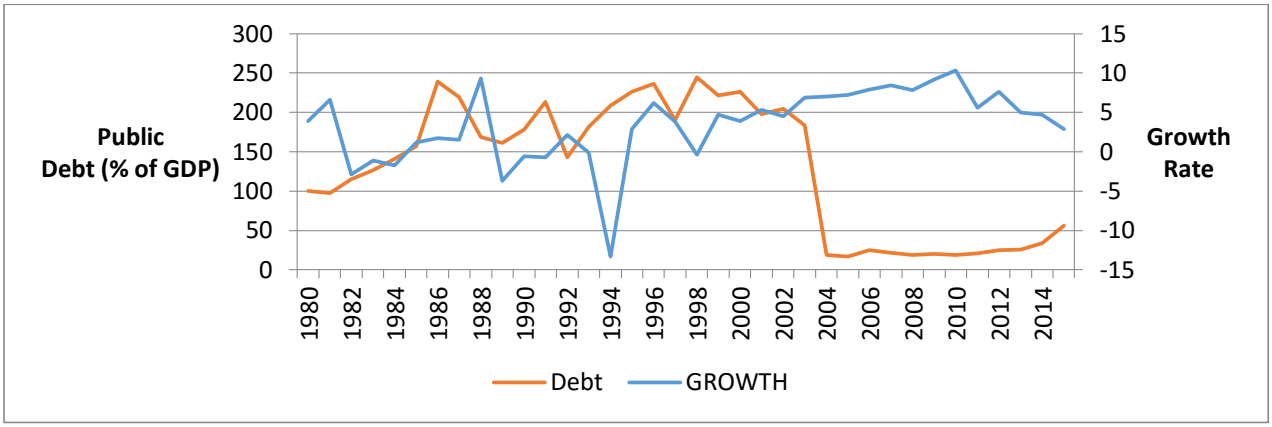


Figure 1 Public debt and economic growth in Zambia

2.5 Conclusion

This chapter highlighted that the dynamics in world commodity prices, particularly of copper, have predominantly determined the trends in economic growth, as well as, the evolution of public debt in Zambia since independence. The Macro-economic performance of the Zambian economy was outlined in five key periods. The performance of the economy in each of these episodes was linked to some key local and international policy changes and external shocks. Like other low-income countries (LICs), Zambia's heavy indebtedness is as a result of both domestic policy failings, and exogenous factors beyond government control.

CHAPTER THREE: LITERATURE REVIEW

3.1 Introduction

A number of scholars and researchers have investigated the relationship between Public debt and economic growth in many countries and various results have been documented. Several other papers investigated the threshold effects of public debt on economic growth. The purpose of this chapter, therefore, is to give a critical review of the literature regarding the threshold effect of public debt on economic growth. This chapter contains three sections; section 3.1 provides the definitions of key concepts relevant to the study, Section 3.2 presents some key theories surrounding threshold effects of public debt on economic growth and section 3.3 proceeds to analyse the most relevant empirical research on threshold effects of public debt on economic growth. Thereafter, a conclusion is made.

3. 2 Definitions of key concepts

3.2.1 Public debt

A country's Public debt, also known as government debt or national debt, is money or credit owed by any level of government; either central, federal, municipal, or local government. Since the government represents the people, public debt is considered to be an indirect debt of the taxpayers in that country. Public debt is often categorized as either domestic or external debt. Domestic debt or internal debt is owed to lenders within the country while external or foreign debt is owed to foreign lenders (UNCTAD, 2005). Debt is seen as a two-edged sword. Meaning that, it is capable of improving welfare when used wisely and in moderation, but can also be disastrous when used recklessly (Cecchetti, Mohanty, & Zampolli, 2011).

Governments usually borrow by issuing securities such as government bonds and Treasury bills in the financial markets. However if credit worthiness is eroded so that domestic and external agents prefer not to invest in government bonds and bills, countries sometimes resort to borrowing directly from commercial banks, bilateral creditors or international financial institutions (IFIs). All government liabilities, including deferred pension payments and delayed payments for goods and services the government has contracted, as seen in Zambia, are considered to be part of public debt (UNDP, 2007).

3.2.2 Economic growth

Economic growth is loosely defined as an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. An economy in this case refers to the physical subsystem of our world made up of stock of population and wealth, and

the flow of production and consumption. Economic growth is usually seen as an increase in the production and consumption of goods and services (Herndon, Ash, & Pollin, 2013). Economic growth occurs whenever people take resources and rearrange them in ways that are more valuable. It refers only to the quantity of goods and services produced and nothing about the quality and methods used in the production (Matiti, 2013). Growth in an economy can be measured in nominal terms, which include inflation, or in real terms, which are adjusted for inflation (Begg, Fischer, & Dornbusch, 2003).

Primarily, economic growth at the national level is usually measured in terms of Gross Domestic product (GDP) or Gross National Product (GNP). These are both monetary measures and thus may not comprehensively capture other aspects of development. The annual measure of economic growth can either be positive or negative. Positive real economic growth implies that there has been an expansion in the economy while negative real economic growth denotes shrinking of the economy. Therefore, negative growth is associated with economic recession and economic depression (Mankiw, 2009).

3.2.3 Public debt and Economic growth Nexus

Empirical literature recommends that appropriate care in the management of public debt should be maintained in order to ensure economic growth and stability. Prudent debt management is achieved when the mobilisation of resources is with low cost of borrowing and minimum financial risk exposure. This is premised on the postulation that debt may have positive as well as negative impacts on economic growth (Mupunga & Le Roux, 2015). There is, therefore, necessity for a balanced perspective on the acquisition of public debt. Debt is not entirely bad: it is probably its use and scale which needs to be managed. Governments, particularly in developing countries habitually use public debt as an imperative tool to finance their expenditures. Economic growth can be increased by effective and proficient utilization of resources to achieve macroeconomic goals. However, if the public debt is not properly utilized, it would restrict economic growth and become the biggest curse for the economy (Chizonde, 2016).

Public debt can have severe effects on the economy, if it increases to unsustainable levels because its servicing can absorb significant government revenues thereby deviating government resources away from developmental projects (Ayres & Warr, 2010). Particularly,

domestic debt servicing is more harmful for the economic growth than the stock of external debt. Moreover, in shallow financial markets, as the domestic debt increases, the interest cost also rises due to holding a large amount of debt in short term instruments. Extensive use of domestic borrowing can have severe implications on the economy. When governments borrow domestically, they use up domestic private savings that would otherwise have been available for private sector lending. In turn, the smaller residual pool of loanable funds in the market raises the cost of capital for private borrowers, reducing private investment demand, and hence capital accumulation, growth and welfare (Matiti, 2013).

External debt can also pose challenges on economic growth but a reasonable level of borrowing is likely to boost economic growth. This is done through capital accumulation productivity growth. Because at early stages of development, countries have small stocks of capital and they have limited investment opportunities. External borrowing for productive investment creates macroeconomic stability. On the other hand, high level of accumulated external debt can have adverse effect on economic growth due to exchange rate risk and depletion of investor confidence (Chudik, Mohaddes, Paseran, & Raissi, 2015).

3.2.4 Threshold effects

Generally, a threshold is a level or magnitude of a system process at which sudden or rapid change occurs. It is a point or level at which new properties emerge in an ecological, economic, or other system, invalidating predictions based on mathematical relationships that apply at lower levels. With regards the relationship between public debt and economic growth, the point at which the effect of public debt on economic growth changes from positive to negative provides information on the growth maximising public debt threshold (Mupunga & Le Roux, 2015).

A strand of the literature has argued that high levels of debt are associated with large negative effects on growth. Several authors support the view that there exists significant threshold levels in the relationship between debt and economic growth beyond which the effects of debt are deleterious. The consensus amongst these authors is that there exists a non-linear effect of debt on economic growth and that higher debt levels beyond some thresholds confer significant negative effects on subsequent growth through both the debt overhang and crowding out effects (Omotosho, Bawa, & Doguwa, 2016; Reignhart & Rogoff, 2010; Mupunga & LeRoux, 2015).

The prescription in this regard is that countries that have accumulated debt levels above their optimal thresholds must deliberately pursue policies to resolve their fiscal problems and lower their indebtedness to sustainable levels. The debate, however, on the growth implications of debt accumulation is an ongoing one and results from empirical works are still inconclusive, as there exists another strand of literature opposing the view that there exists a debt threshold above which debt constrains output growth (Omotosho, Bawa, & Doguwa, 2016).

3.3 Theoretical Review

3.3.1 Crowding in/out effect

The crowding in effect in an economy can be viewed as an attempt by Government to increase private sector investment through undertaking capital projects such as the constructions of roads, other infrastructure, hydro-power stations, and education or health care facilities which ultimately reduce the marginal cost of producing one unit of output for the private sector (Mankiw, 2009). This entails that huge Government spending directed towards production of capital goods can potentially increase the stock of public capital investment and thus crowd in private sector participation. Undertaking such projects would require Government to issue debt instrument or raise taxes.

Public debt contracted to finance the budget deficit is a primary source of the crowding out of private investments (Mankiw, 2009). The economic consequence of huge borrowings by the Government is an increase in interest rates. The increase in interest rates may consequently reduce or crowd out private-sector investments in plants and equipment. This decline in investment means that the overall economy has a smaller capital stock with which to work, which then decreases the future growth prospects of the nation.

3.3.2 Debt Overhang theory

The development of a database concerning fiscal crises in recent years led to the Public debt overhang theory. Before the development of data by Reinhart et al. (2012), it was not known that public debt affects economic growth (see Barro and Sala-i-Martin, 1995 and Fischer, 1991). It was later that Krugman (1988) coined the term “debt overhang” as a situation in which a country’s expected repayment ability on external debt falls below the contractual value of debt. Cohen’s (1993) theoretical model posits a non-linear impact of foreign borrowing on investment as suggested by Clements et al. (2003) who indicates that this relationship can be arguably extended to growth (Mupunga & Le Roux, 2015).

Therefore, up to a certain threshold, foreign debt accumulation can promote investment, while beyond such a point the debt overhang will start adding negative pressure on investors' willingness to provide capital. In the same vein, the growth model proposed by Aschauer (2000), in which public capital has a nonlinear impact on economic growth can be extended to cover the impact of public debt. Assuming that government debt is used at least partly to finance productive public capital, an increase in debt would have positive effects up to a certain threshold and negative effect beyond that threshold (Omotosho, Bawa, & Doguwa, 2016).

2.2.3 Laffer Curve

Finally, more recent studies have attempted to consolidate the above views by developing models with non-linear effects of debt on growth (see Chongo, 2015; Omotosho, et al 2016; Reinhart & Rogoff, 2010 and Mupunga & Roux, 2015). Findings of these studies suggest that borrowing has a positive impact on investment and growth up to a certain threshold level; beyond this level, however, its impact is adverse. As indicated by Cohen (1993), the relationship between debt and investment can be represented as a kind of Laffer curve, with expected repayment falling as outstanding debt increases beyond a threshold level. The theoretical literature, thus, suggests that borrowing has a positive impact on investment and growth up to a certain threshold level; beyond this level, however, its impact is adverse, giving rise to a "Laffer curve"-type of relationship between debt, on the one hand, and investment and per capita income growth on the other.

Debt service, in contrast to the total debt stock, can also potentially affect growth by crowding out private investment or altering the composition of public spending. Other things being equal, higher debt service can raise the government's interest bill and the budget deficit, reducing public savings. This in turn, may either raise interest rates or crowd out credit available for private investment. Higher debt service payments can also squeeze the amount of resources available for infrastructure and human capital formation, with further negative effects on growth. The figure 3 below illustrates the Debt Laffer Curve.

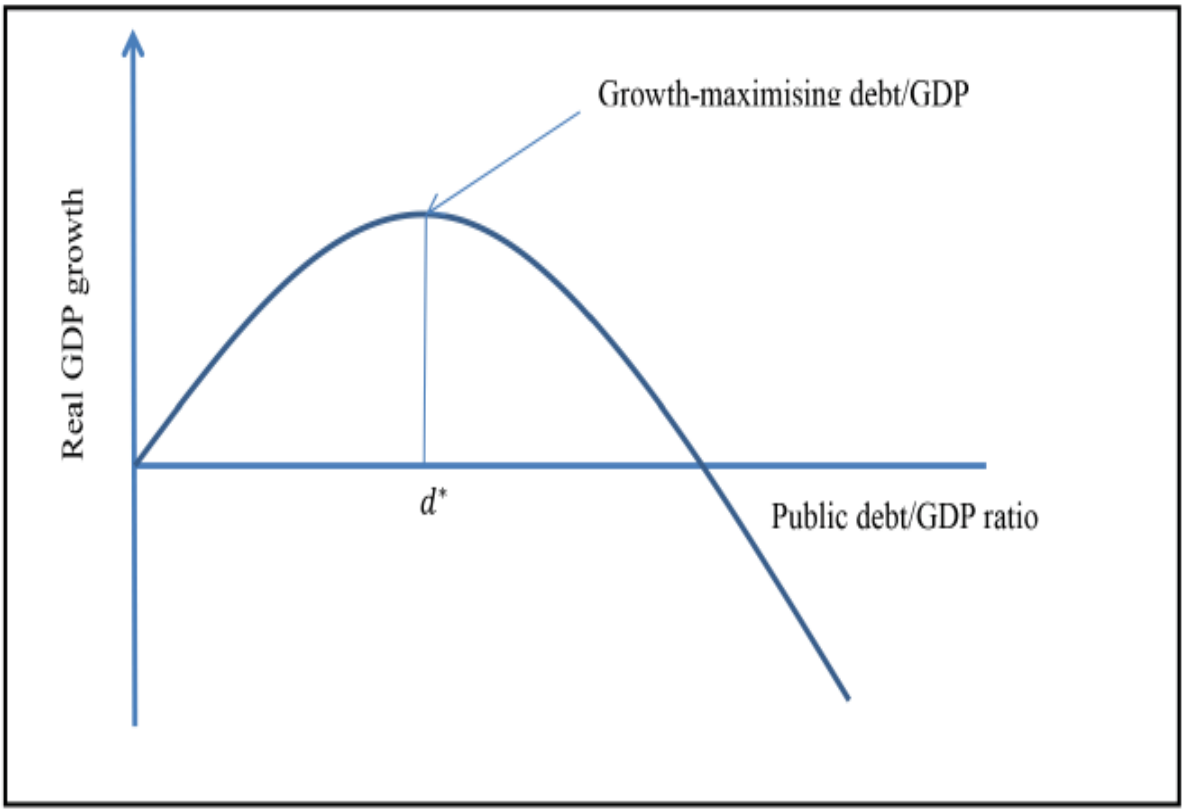


Figure 2 The debt Laffer curve

(Source: Pattillo, Poirson & Ricci, 2002)

3.4 Empirical Review

There has been considerable research on the relationship between Public debt and economic growth. Recent studies indicate that there exits some non-linearity in the relationship and that public debt can influence the economy both in the short-run and the long-run. A great majority of growth studies have revealed that debt can stimulate aggregate demand and national output in the short-run, but crowd-out capital and reduce output in the long-run (Mankiw, 2009). Below are empirical studies examining the relationship between public debts and economic growth, with most of them identifying the threshold effect of public debt on economic growth.

3.4.1 Cross-country studies

Reinhart and Rogoff (2010) studied the relationship between high public debt levels and economic growth and inflation in 44 countries utilizing data for about 2 centuries. The results indicated that high debt-to-GDP ratios of 90 %and above are associated with lower growth outcomes in both advanced and emerging market economies. Further, the authors did not find any obvious link between debt and growth for 20 advanced countries until public debt

reaches a threshold of 90%. However, the study, found that lower levels of external debt-to-GDP, about 60 %, are associated with adverse reactions for the emerging market economies.

In a study entitled "Does High Public Debt Consistently stifle Economic Growth? A Critique of Reinhart and Rogoff"; Herndon, Ash and Pollin (2013) replicated the work of Reinhart and Rogoff (2010) and found that coding errors, selective exclusion of available data, and unconventional weighting of summary statistics led to errors that inaccurately represented the relationship between public debt and GDP growth among 20 advanced economies. The authors showed that the average real GDP growth rate for countries carrying a public debt-to-GDP ratio of over 90 %was actually 2.2 %, and not 0.1%, as indicated by Reinhart and Rogoff (2010). This, therefore, indicates that average GDP growth at public debt-to-GDP ratios over 90 %is not significantly different than when public debt-to-GDP ratios are lower.

Chudik et al. (2015) studied the long-run impact of public debt expansion on economic growth and investigated whether or not the debt-growth relation varies with the level of indebtedness. The study was conducted using data on a sample of 40 countries grouped into advanced and developing over the period 1965-2010. They used the autoregressive distributed lag (ARDL) and the distributed lag (DL) approaches to investigate the debt-threshold effect in a panel comprising both developing and developed countries. Results indicated that estimates of threshold were between 60 and 80% for the full sample; between 30 and 60% for developing countries; and 80% for the advanced economies. However, when cross-sectional error dependence was accounted for, the authors were unable to find a universally applicable threshold effect. Regardless of the threshold results, the authors found significant negative long-run effects of public debt build-up on output growth. They concluded that, provided that public debt is on a downward trajectory, a country with a high level of debt can grow just as fast as its peers.

In their quest to find out if a magic threshold exists between debt and growth, Pescatori, Sandri, and Simon (2014) used data based on the IMF Fiscal Affairs Department database on gross government debt-to-GDP ratios that covers nearly the entire IMF membership as far back as 1875. They also used supplementary data on interest payments and primary deficits for 19 advanced economies from Abbas et al (2011) as well as real GDP data from Maddison (2003) and other data from Reinhart and Rogoff (2010). The study concluded that there is no simple threshold for debt-to-GDP ratios beyond which medium-term growth prospects are

severely compromised. This state of affair must have been due to using a panel of both developing and developed countries data. Furthermore, they observed that debt trajectory can be as important as the debt level in understanding future growth prospects, since countries with high but declining debt appear to grow equally as fast as countries with lower debt. Nonetheless, they found that higher debt levels tend to correlate with higher output growth volatility which can hurt economic welfare.

Egert (2013) in a study entitled "The 90% Public Debt Threshold: The Rise and Fall of a Stylised Fact" extended the time coverage of the sample used by Reinhart and Rogoff (2010) that was made public by Herndon et al. (2013) and went as far back as 1790. They put the data-set to a formal econometric test to identify public debt thresholds endogenously. Egert (2013) estimated bivariate threshold models, in which the effect of debt on growth depends on the level of debt using the testing procedure developed by Hansen (1999) which helps determine the threshold values endogenously through a grid search and which tested the different models sequentially against one another using bootstrapping methods. The results indicate that the nonlinear relation from debt to growth is not very robust and that the negative association between debt and growth may set in at debt levels as low as 20 % of GDP. Further, it was found that greater thresholds may exist but their magnitude was highly uncertain. Egert (2013) added that individual country estimates reveal a large amount of cross-country heterogeneity in debt-growth thresholds. Their result was an econometric confirmation that the 90 % public debt threshold identified by Reinhart and Rogoff (2010) does not hold.

Minea and Parent (2012) also noted that, Reinhart and Rogoff (2010) found that differences in median growth are much smaller than differences in average growth. This illustrates the importance of the robustness tests by showing that alternative data sources yield results which are somewhat different from those of Reinhart and Rogoff (2010). In particular, they used data from the IMF Public Debt Database and found that the reduction in average (and median) growth rate between countries with a debt-to-GDP ratio below and above 90% is small and not statistically significant.

Caner, Grennes, and Köhler-Geib (2010) sought to find the tipping point where sovereign debt turns bad. The analysis relied on a data set of 99 countries - 74 developing and 25 developed countries, consisting of yearly observations for the period 1980-2008.The

methodology of the analysis drew on a threshold least squares regression model following Hansen (1999) and also used pooled least squares regressions. Overall, the results suggest that thresholds exist in the relationship between long-run average public debt-to-GDP ratio and long-run GDP growth. Further, the results suggest that it is crucial to take into account initial GDP. Additionally, the threshold level differs between developing and developed economies. The results indicate that the threshold level of the average long-run public debt-to-GDP on GDP growth is 77% for the entire sample and for the subsample of developing countries, a lower threshold of 64% debt-to-GDP ratio was found. These findings are consistent with the notion by the IMF that Zambia like other low income countries must accept 60% of GDP as the public debt threshold.

Nhu, Tung and Vy (2015) worked to identify the threshold level in the relationship between public debt and economic growth in developing countries. The research used annual data from 1985 to 2013. The main model was estimated using the Ordinary Least Squares (OLS) method, and then Two-Stages Least Squares (2-SLS) and Generalized Method of Moments (GMM) techniques were applied to deal with endogeneity. The results show that, if public debt rate is greater than 13%, the relationship will be positive (the positive threshold is 13%) but if public debt rate overcomes 39%, it will switch to negative (the negative threshold is 39%).

Greenidge et al. (2012) investigated threshold effects of sovereign debt using evidence from the Caribbean. The study used annual data ranging from 1980 to 2010 for 12 Caribbean countries. The threshold least square regression model was adopted. The main finding was that there exists a threshold debt-to-GDP ratio of 55–56%. Moreover, the debt dynamics begin changing well before this threshold is reached. Specifically, at debt levels lower than 30 percent of GDP, increases in the debt-to-GDP ratio are associated with faster economic growth. However, as debt rises beyond 30 percent, the effects on economic growth diminishes rapidly and as debt levels reach 55–56% of GDP, the growth impacts switch from positive to negative.

Lee et al. (2016) tested for a debt-threshold Effect on output growth. The dataset was a revised and corrected version of the data used by Reinhart and Rogoff (2010). For the main analysis, they used the post-war sample of ‘advanced economies’. The sample covered the years 1946 to 2009 and the analysis employed the median regression model. While they found no evidence of a threshold around 90%, their findings from the post-war sample

suggest that the debt threshold for economic growth may exist around a relatively small debt to-GDP ratio of 30 per cent.

Bilan and Ihnatov (2015) examined the two sided story regarding public debt and economic growth using a panel of 33 European countries (28 European Union Member States and 5 candidate countries to European accession) over the period 1990-2011. The main model was estimated using instrumental variable estimation techniques. The Instrumental variable estimation technique was due to endogeneity considerations in the study. The results of the study confirm the existence of an inverted "U" shaped relationship, with a maximum debt threshold of about 94% of debt to GDP. Previously, Checherita and Rother (2010) used a panel of 12 Euro-area countries over a period of 1970-2011 to assess the impact of high and growing government debt on economic growth. The study found evidence of a non-linear impact of public debt on per-capita GDP growth rate. It unveiled a concave (inverted U-shape) relationship between the public debt and the economic growth rate with the debt turning point at about 90-100% of debt-to-GDP.

Siddique and Malik (2001) examined the debt-growth relationship in 3 South Asian countries, tested the non-linearity in the relationship and showed the threshold levels for the 3 economies. Their analysis supported the presence of a nonlinear relationship between economic growth and all their debt burden indicators. The study indicated two thresholds of 61 and 88 per cent, for the two debt/GDP ratios computed, with Pakistan's debt impact on economic growth being negative having crossed the threshold debt indicators. Sri Lanka and India, however, had debt ratios lower than the critical levels, and their debt impact on growth was positive. Their critical values for debt service-to-exports and total debts-to-exports were 12.75 and 197.0 per cent, respectively.

3.4.2 Country studies

Lechtenberg (2017) conducted a comprehensive Country- Specific Analysis of Debt-to-GDP Threshold Effect on Output for a number of countries. The annual data is extracted from Reinhart and Rogoff's (2010) dataset used in their paper "Growth in a Time of Debt." Observations for each variable extend as far back as 1861. The countries analyzed were Australia (annual observations from 1862-2008), Canada (1871-2008), Chile (1862-2008), France (1862-2008), Germany (1862-2008), Greece (1914-2008), Italy (1862-2008), New Zealand (1871-2008), the United Kingdom (1862-2008), and the United States (1871-2008).

The main model was estimated by employing OLS. The study also used the Instrumental Variable approach to control the endogeneity.

Within the sample, statistically significant thresholds were found for France, Greece, Italy, the United Kingdom, and the United States. The threshold for France was found to be 80%. The highest thresholds for the three other countries were 103 %, 156%, and 63% for Greece, the U.K., and the U.S., respectively. Additionally, Italy's debt-to-GDP threshold was established at 47%. On the other hand, statistically significant thresholds were not found for Australia, Canada, Chile, Germany, and New Zealand. Therefore, their regression results were not included.

Kumara and Cooray (2013) sought to find out if there exists any threshold Level for Pubic Debt in relation to economic growth in Sri Lanka using time series data for the period 1960-2010. The authors made use of a quadratic econometric model to investigate a non-linear connection between public debt and growth. The main model was estimated by employing OLS. The study also used the Instrumental Variable approach to control for endogeneity. The lagged public debt-to-GDP ratio and lagged values of other control variables were used as instrumental variables. The study found out that there is a nonlinear relationship between the public debt and GDP per capita growth in Sri Lanka. The threshold level for public debt is 59.42% of GDP. Above this level, public debt generates a negative impact on GDP per capita growth. These finding strongly justified the 2016 debt reduction target of the government, which aimed to reduce the then debt ratio of 79.14% down to 60%.

Omotosho et al. (2016) supposedly used quarterly data from 2005 to 2015 to empirically determine the optimal public debt threshold for Nigeria. In order to understand the possible non-linear relationship between public debt and economic growth in Nigeria and estimate the tipping point thereof, the authors adopted the Khan and Senhadji (2001) approach in their econometric analysis. Regression results confirmed the existence of a non-linear relationship between public debt and economic growth in Nigeria. The following debt-growth thresholds were established: total public debt to GDP (73.70%); external debt to GDP (49.4%); and domestic debt to GDP (30.9%). The major disadvantage of this study is linked to the dataset used. It has been alleged by subsequent authors like Eboreime and Sunday (2017) that the dataset used had errors which could potentially invalidate these findings.

Having taken noted that the threshold values established by Omotosho, Bawa and Doguwa (2016) are completely outside the 2005-2015 data set claimed to have been used in the paper. Eboreime and Sunday (2017), conducted another analysis of public debt-threshold effect on output growth in Nigeria with what they referred to as the actual 2005–2015 dataset. The study adopted an eclectic methodological approach by focusing on basic least squares, autoregressive distributed lag and global optimization methods. The findings in respect to the debt-growth thresholds are as follows: total public debt-GDP (55.2 %); external debt-GDP (50 %); and domestic debt-GDP (13.6%). The change in the dataset caused significant changes in the results regarding the threshold effects.

Mupunga and le Roux (2015) used annual data from 1980–2012 to estimate the optimal growth-maximizing public debt threshold for Zimbabwe using non-linear regression techniques. The authors employed a quadratic econometric model to fit a non-linear connection between public debt and growth. A crisis dummy variable is also included to account for the crisis experienced by Zimbabwe in the period 2000–2008. The crisis dummy was assigned the value of 1 for the period after 2000 up to 2008 and 0 for the earlier periods and from 2009 onwards. The model was estimated using an instrumental variable approach to avoid the potential reverse causality from economic growth to the public debt ratio. The results of the analysis confirmed the existence of an inverted U-shaped relationship between public debt and economic growth in Zimbabwe. The optimal growth-maximising public debt threshold was estimated at a public debt-to-GDP ratio of between 45 and 50%.

Zaaruka (2007) investigated the threshold effect in the relationship between public debt and economic growth in Namibia using annual secondary time series data spanning the period between 1975 and 2005. The paper adopted a methodology used in similar studies particularly the model by Pattilo et al. (2002). This model was extended to include total debt with more emphasis on the domestic debt channels due to the fact that Namibia's total debt portfolio is dominated by domestic debt. For purposes of examining the presence of a nonlinear relationship between public debt and economic growth, the author made use of a quadratic econometric model. Further, Ordinary Least Squares (OLS) method was used in the estimation of the model. In order to get rid of the possible endogeneity, the public debt and the control variables were lagged. The findings of the study show that the impact of debt on economic growth in Namibia brings out an inverted U-shaped pattern. The empirical evidence established indicates that threshold level is about 38% of debt-to-GDP.

While other authors so far reviewed investigated threshold effects of total public debt on economic growth, Maghyereh, Omet and Kalaji (2005) made use of annual time series data ranging from 1970 to 2000 to investigate the threshold effect of external debt on economic growth in Jordan. The main model was estimated using ordinary Least Squares estimation method. With similar studies usually suffering problems of endogeneity, this study also used the Two-Stage Least Squares method (2SLS) to control for the problem where all explanatory variables were treated as potentially endogenous to growth. The findings of the study indicate that the optimal level of external indebtedness is about 53% of debt-to-GDP ratio.

Tuffour and Joseph (2012) raised a question as to whether the public external debt had just reached a point which would slow economic growth in Ghana. In other words, the study considered whether or not such a point exists and examined the growth impact if the Ghanaian economy surpassed such a threshold level. The study was based on 1970-2009 annual time series data. Using Least Squares estimation method, an inverted U-shape effect of debt on output growth was revealed. The external debt threshold was estimated to be 46.2%. The paper also uncovered a cumulative growth loss of surpassing the estimated external debt threshold of 12.28 percentage points. This led to an annual average growth loss of 0.31 percentage points.

3.4.3 Studies on Zambia

Chongo (2015) employed Country specific time-series observations to investigate the impact of public debt on economic growth in Zambia from 1980 to 2008. Notable estimation techniques employed in the analysis of growth effects of debt included, the Ordinary Least Squares (OLS), Instrumental Variables and Generalised Methods of Moments and the Vector Auto-Regressive (VAR) framework. Results from the analysis confirm a long-run negative relationship between public debt and economic growth. The result on the impact of public debt on private investments and domestic savings also gives indication to the presence of the crowding-out and debt-overhang effects which can be explained by a rising debt burden measured by both the stock of Public Debt to Gross Domestic Product (GDP) and Public Debt Service to Revenues. The study also found a positive relationship between public investment and public debt indicating a possibility of crowding-in effect. However, the extent to which this affects economic growth depends on how the private sector responds given

existing fiscal and monetary policies. Chongo (2015) did not estimate a threshold level for Zambia.

In their study, Daka et al. (2017) empirically examined the impact of External debt on the Economic growth in Zambia using annual time series data spanning 1980 to 2014. The Autoregressive Distributed Lag Model (ARDL) and bounds testing approach to test cointegration were employed. The results of the study indicate that External debt is found to have a positive relationship with economic growth in the short run and a negative relationship in the long run. This suggests the existence of a debt overhang problem in Zambia. In addition, the Granger causality test was used to check for the direction of causality among the variables. The findings established a unidirectional causality from external debt to economic growth.

With regards the estimation of threshold effects, Phiri (2013) employed a threshold autoregressive (TAR) econometric approach to study the relationship between economic growth and inflation in Zambia. It was found that a rise in inflation is associated with improved economic growth as long as inflation is kept below 22.5% and if it exceeds this level, inflation is likely to have a negative impact on economic growth. This may explain the reason why Zambia had negative growth rates in the 1970s when the country had very high inflation rates. Phiri (2013) used Conditional Least squares (CLS) to estimate the model and also concluded that economic growth is positively influenced by foreign direct investment.

3.5 Conclusion

It is evident from the reviewed literature that the discussion of the threshold effect of public debt on economic growth is an ongoing one and results from empirical works are still inconclusive. While many studies found empirical support for a significant threshold effect in the relationship between debt and economic prosperity, authors like Chudick et al. (2015), Pescotori et al. (2014) and Egert (2013) question the existence and robustness of this supposed threshold effect. Most of the findings, however, are in line with the theoretical postulations under the Crowding in, Debt overhang and Debt Laffer curve theories.

While there have been a number of studies on the topic of public debt in Zambia, there has not been any study known to the author that investigates the threshold effects of public debt on growth. Two notable studies are those of Chongo (2015) and Daka et al (2017) who only

looked at the impact of debt on economic growth in Zambia from 1980 to 2008 and 1980 to 2014 respectively. This current paper therefore builds on Chongo (2015) by estimating the optimum growth maximising level of public debt. The only study, in the Zambia case, known to the author that dwelt holistically on threshold effects was conducted by Phiri (2013). He employed a threshold autoregressive (TAR) econometric approach to study the relationship between economic growth and inflation in Zambia.

Table 1 Summary of country specific literature review

Author (year)	**Country**	**Time Frame**	**Threshold level**	**Methodology**
Mupunga & le Roux (2015)	Zimbabwe	1980-2012	45- 50 %	OLS, IV technique
Zaaruka (2007)	Namibia	1975-2005	38%	OLS, IV technique
Omotosho et al (2016)	Nigeria	2005-2015	73.70%	OLS panel threshold approach,
Eboreime and Sunday (2017)	Nigeria	2005-2015	55.2%.	ARDL
Tuffour, Joseph. (2012)	Ghana	1970-2009	46.2% (External Debt)	OLS
Kumara et al (2013)	Sri Lanka	1960- 2010	59.42%	OLS, IV technique
Maghyereh et al (2005)	Jordan	1970-2000	53 % (External Debt)	OLS, 2SLS

CHAPTER FOUR: METHODOLOGY

4.1 Introduction

This chapter considers the methodology used in investigating the threshold effect of public debt on economic growth in Zambia. Section 4.2 provides the econometric models used in the study. After presenting the bivariate and multivariate growth models, the definitions of the variables and sources of the data, followed by the estimation methods of the study are presented in sections 4.3 and 4.4 respectively. Thereafter the hypotheses are explained in section 4.5. This methodology draws from the approaches used by Chongo (2015) and, Mupungu and Roux (2015).

4.2 Econometric Models

In seeking to estimate an optimal growth-maximising public debt threshold for Zambia, this study draws from the study on Zimbabwe by Mupungu and Roux (2015) who employed both a quadratic form regression model and a threshold regression model. The former was used to analyse the relationship between public debt and economic growth while the later was used to estimate the growth-maximizing public debt threshold. The analysis begins by estimating the following bivariate growth model:

<u>Model 1: Bivariate Quadratic Growth model</u>

$$\boldsymbol{growth_t = \alpha + \beta_1 debt_t + \beta_2 debt_t^2 + e_t}$$

Where growth is the real GDP growth rate, debt is the public debt-to-GDP ratio and $\boldsymbol{e_t}$ is the stochastic error term. This bivariate quadratic growth equation will be estimated and plotted consistent with the approach taken by Checherita-Westphal & Rother (2012). Thereafter, the growth model is improved upon by adding a number of control variables which include Foreign Direct Investiment (FDI) and Population size. This is meant to improve the diagnostics of the bivariate model with respect to autocorrelation and residual normality among others.

<u>Model 2: Multivariate Growth model</u>

$$\boldsymbol{(2) growth_t = \alpha + \beta_1 debt_t + \beta_2 debt_t^2 + othercontrols_t + e_t}$$

It must be noted that this model does not seek to assess the determinants of economic growth and will thus not focus on the impact of the control variables on growth.

4.3 Control Variables

The control variables in the multivariate growth model will include Foreign Direct Investment (FDI), Government tax Revenue, per capita GDP and population-as a measure of labour supply. This is in accordance with the Solow-Swan Model and the Ramsey-cass-koopmans Model (Romer, 1996). Furthermore empirical studies on the determinants of economic growth have consistently found that measures of capital stock such as gross capital formation and FDI, and proxies of labour such as employment and population size are key determinants of economic growth (see Ndimbiri et al., 2012, Ismaila and Imoughele, 2015, Mbulawa 2015, and Chongo 2015). Barro's endogenous growth model postulates that economic growth is influenced by government expenditure and this is also included in the model since it has been validated by many studies such as Ismaila and Imougehele (2015) and Chongo (2015) who also included government expenditure in her growth model which sought to assess the impact of public debt on economic growth in Zambia.

4.4 Definitions and Data sources

This time series research will utilize annual data for the period 1980 to 2015. The data on the specific variables has been collected from the Ministry of Finance, World Bank, Penn World Tables, and the Bank of Zambia. The Table 2 summarizes the definitions and sources of the data on the specific variables.

Table 2 Definitions and Sources of Variables

Variable and symbol	***Definition***	***Sources***
GDP Growth(growth)	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. *Used as given	World Bank (World Development Indicators)
FDI	The local currency value of foreign direct investment as a percentage of GDP	World Bank (World Development Indicators)
Population	The percentage change in population size	Penn World Tables

growth(POP_G)	for Zambia.	(Zambia Country Statistics)
Exchange rate (Exchp)	Percentage change in Kwacha equivalent to 1 US Dollar	World Bank (Zambia Country Statistics)
Debt-to GDP Ratio (Debt)	Ratio of Total Public Debt in Millions of Kwacha to Gross Domestic Product in Millions of Kwacha *Computed as the sum of annual Public External Debt stock (transformed to local currency units using the year end exchange rate) and annul Public Domestic Debt Stock divided by Gross Domestic product.	Ministry of Finance Bank of Zambia (Zambian Central Bank)
Inflation Rate (Inf)	Percentage change in general price level measured by GDP deflator	World Bank (World Development Indicators)

4.5 Estimation Techniques

4.5.1 Estimation of Bivariate Quadratic Model

The Bivariate model will be estimated using OLS regression and Instrumental variable regression due to possible endogeniety problem between economic growth and public debt. Lagged public debt will be used as the instruments in this regression. This approach was used by Mupungu and Le Roux (2015), Zaaruka (2007), Hemanth et al. (2013) and Maghyereh et al. (2005). The following are some of the other estimation techniques to be employed:

4.5.2 Testing for Stationarity

All the variables will be tested for unit root using both the Augmented Dickey Fuller (ADF) Test and the Phillip-Peron (PP) Test. The null hypotheses for both tests are rejected if the generated t-statistics are greater than the critical values. It seems prudent to conduct the ADF test without taking into account either the trend or the intercept because doing so would reduce the strictness of the test and thus increase the chance of deeming I(2) Variables to be either I(1), or I(0) variables to be I(0). Furthermore, the tests will be conducted with

automatic lag selection using the Schwarz Information criteria (SIC) with maximum lag of 10 (Chongo, 2015; phiri, 2013)

4.5.3 Estimation of Multivariate Model

Based on Mupungu and Roux (2015), the Multivariate model will also be estimated using Threshold autoregressive (TAR) model in order to investigate the threshold effect of public debt on economic growth in Zambia. Prior to this estimation, the Johansen test will be used to test for the existence of a long-run relationship among the variables in the model in order to add credence to the estimated long-run model. It must be noted, however, that only one long-run equation will be estimated regardless of the number of cointegrating equation found by the Johansen test. For the sake of simplicity, only the first lagged term, AR (1), will be added to the model (Mupungu and Roux, 2015). The model will also be subjected to the Durbin-Watson test and the Jarque-Bera Test among others.

4.5.4 Estimation of Bivariate Model (Graphical Test)

In order to test for the existence of a Laffer-curve relationship between economic growth and public debt, the bivariate model estimated using ordinarily least squares (OLS) will be used to conduct a graphical test. The predicted values from the regression will be used to plot a quadratic fit over a scatter of the GDP growth (on the Y-axis) and the Debt-to-GDP ratio (on the x-axis). A visual inspection of the graph will be able to reveal whether there exists a Laffer-curve relationship between the dual. The model results will be subjected to a number of diagnostic test which include, but not limited to, the Durbin-Watson autocorrelation test and the R-Squared test for model fit. The plot will also indicate the optimal growth-maximizing debt threshold for Zambia. The threshold level will be indicated by the turning point of the Debt Laffer Curve.

4.5.5 Testing for the Optimal Tipping point (Quantitative Test)

Following the approach by Mupungu and Roux (2015), the optimal growth-maximising public debt threshold is further tested using a threshold approach consistent with the approach use by Hansen (1996, 2000). The threshold model is specified as shown in equations (3) and (4):

$$(3)\boldsymbol{growth_t = \alpha + \beta_1 debt_t + \beta_2 debt_t^2 + othercontrols_t + D_t + e_t D_t \leq \gamma}$$

$$(4)\boldsymbol{growth_t = \alpha + \beta_1 debt_t + \beta_2 debt_t^2 + othercontrols_t + D_t + e_t D_t > \gamma}$$

Where $\boldsymbol{D_t}$is the threshold variable that takes the value of 1 if the public debt-to-GDP ratio exceeds the calibrated growth-maximising public debt threshold (d*) and zero if not, $\boldsymbol{\gamma}$ becomes the threshold and is the vector of other control variables. The other variables remain the same as in the specified growth model in equation (2).

In order to conduct this threshold analysis and thus find $\boldsymbol{\gamma}$ which will hereafter be referred to as the growth-maximizing public debt threshold, Mupungu and Roux (2015) employed a somewhat trail-and-error method. They estimated the models at different prespecified thresholds and then observed the coefficients of the debt variable in order to assertion whether there is a threshold effect. This study will use the EViews 9 based optimal threshold regression estimation. This approach only requires the specification of the number of thresholds to be investigated in the regression and then the threshold effect is sequentially determined. This approach will therefore be able to optimally find $\boldsymbol{\gamma}$ without the need to guide the analysis on which threshold levels to test.

4.6 Research Hypothesis

H1: Public debt negatively influences Zambia's economic growth

The relationship between economic growth and public debt is complex because it may depend on the level of debt the country has contracted. This notion is reinforced by the Debt Overhang theory and indeed the Debt Laffer Curve presented earlier. This notwithstanding, a number of studies has found a negative relationship between public debt and economic growth. These include Chongo (2015) and Baglan and Yoldas (2013)

H2: ***Population growth positively influences Zambia's economic growth***.

The growth in population is said to positively influence both output and economic growth. Since human capital is an input in production, when a nation has an increase in human capital growth its productive capacity would also increase. This would make it produce more output and accelerate economic growth. The positive impact of capital on growth is a major proposition in economic growth theories like the Ramsey Model. Research on economic growth conducted by Ndambiri, et al., (2012), Ismaila and Imoughele (2015) and Mbulawa (2015) all found that capital positively influences economic growth.

H3: ***Foreign Direct Investment (FDI) positively influences Zambia's economic growth***

FDI is also said to have some positive influence on both output and economic growth. Since capital stock is an input in production, when a nation has an increase in capital stoke its productive capacity would also increase. Empirical studies on the determinants of economic growth has consistently found that measures of capital stock such as gross capital formation and FDI are key determinants of economic growth (see Ndimbiri et al., 2012; Ismaila and Imoughele, 2015; Mbulawa, 2015, and Chongo, 2015)

4.7 Conclusion

It is apparent from above that this research follows a time series econometric methodology. In attempting to strengthen the basic understanding of how the threshold effect of public debt on economic growth for Zambia is established, the debt Laffer curve and Debt Overhang hypotheses are used to provide the theoretical basis for analysis and used in explaining the possible nonlinear relationship between Public Debt and economic growth. Thereafter, the Threshold autoregressive model is estimated after a quadratic bivariate model is estimated using OLS regression and Instrumental variable regression in order to deal with possible endogeneity problem (the one period lagged values of debt are used as instruments). The bivariate model is improved upon by adding control variables which include FDI, Population growth, government revenue and GDP per capita.

CHAPTER FIVE: RESULTS AND FINDINGS

5.1 Introduction

This chapter presents the major findings of this research and corresponding discussions. Section 5.2 presents some of the salient points concerning the statistical properties of the variables of interest and is followed by the analysis and results section. To be specific, section 5.3 documents the Unit Root test results while section 5.4 displays the results from the Bivariate Quadratic Model. The Multivariate Model results are shown in section 5.5. After the presentation and interpretation of results is completed, the diagnostic tests are presented in section 5.6 before making a conclusion in section 5.7.

5.2 Descriptive Statistics

The descriptive statistics will help describe the basic features of the data in the current study. They provide a simple summary about the sample and the measures. The major variables of interest in this research are economic growth (*GDP*) and public debt-to-GDP ratio (*DEBT*). The other variable are Foreign Direct Investment (FDI), Inflation rate (INF), Government tax Revenue (REVENUE), per capita GDP (GDP_PC), and Population size (POP_G). Table 3 and Table 4, below present some key summary statistics on these variables. All these variables have 34 observations.

Table 3 Summary Statistics of Variables

	DEBT	DEBT2	GDP	FDI
Mean	18.69312	744.9794	3.652386	4.116249
Median	15.45630	238.9008	4.578102	4.188963
Maximum	64.12817	4112.422	10.29821	9.605168
Minimum	0.010315	0.000106	-8.625442	-0.991565
Std. Dev.	20.18744	1214.215	4.175764	2.667243
Skewness	0.976130	1.912878	-0.779551	0.266593
Kurtosis	2.942453	5.429598	3.368064	2.360363
Jarque-Bera	5.404062	29.09742	3.635547	0.982348
Probability	0.067069	0.000000	0.162387	0.611908
Sum	635.5662	25329.30	124.1811	139.9525
Sum Sq. Dev.	13448.58	48652500	575.4212	234.7682
Observations	34	34	34	34

Table 4 Summary Statistics of Variables

	INF	REVENUE	GDP_PC	POP_G
Mean	37.75017	6.12E+08	0.860052	2.879985
Median	19.01013	4.42E+08	1.891623	2.812496
Maximum	165.5340	1.53E+09	7.027277	3.421322

Minimum	5.559686	1.71E+08	-10.76978	2.533719
Std. Dev.	40.35287	4.11E+08	4.055669	0.254829
Skewness	1.738623	1.160471	-0.777854	0.903143
Kurtosis	5.216285	2.944793	3.173212	2.842208
Jarque-Bera	24.08781	7.635577	3.471160	4.657383
Probability	0.000006	0.021976	0.176298	0.097423
Sum	1283.506	2.08E+10	29.24177	97.91948
Sum Sq. Dev.	53735.68	5.57E+18	542.7988	2.142944
Observations	34	34	34	34

The summary statistics above reveal some key characteristics of the variables. In terms of skewness, most of the variables are positively skewed but within an acceptable range. Both Debt and GDP do not significantly depart from the normal distribution since the values of skewness and kurtosis are around 0 and 3 respectively. The Jarque-Bera test statistics for normality are also low and insignificant, either at the 1% level or at the 5% level, for all variables, except for Debt-squared and inflation variables. Almost all the variables have non-zero standard deviations with a maximum from Debt-squared and the minimum from population size.

The descriptive statistics in the tables above show that Zambia attained a minimum growth rate of -8.625% and a maximum of 10.298% during the period under review. On the other hand, the minimum debt-to GDP ratio was 0.01% while the maximum was 64.23%. Similarly, the country's public debt-to-GDP ratio averaged 18.69%, while economic growth averaged 3.65%. The variables of interest, notably the economic growth rate and the public debt-to-GDP ratio, show significant variation. This considerable variation in all the key variables translates into more efficient estimates (Chizonde, 2016).

5.2 Root Test Results

The unit root test was used to determine whether variables of the study are stationary or not. The null hypothesis of no stationarity was tested against a stationary time series. The results of the test are shown in Table 5.

Table 5 Unit-Root Test results

Variable	**ADF at level**	**ADF at 1st diff**	**PP at level**	**PP at 1st diff**	**conclusion**
DEBT	-0.521978	-2.744537***	-0.300512	-2.801594***	I(1)
DEBT2	-1.311019	-3.169895***	-1.040217	-3.183394***	I(1)
GDP	-0.847592	-7.587813***	-2.476242**	-15.14248***	I(1)

FDI	1.564158	-5.884376***	-0.918099**	-14.54999***	I(1)
INF	-1.342773	-5.252600***	-1.437583	-5.252600***	I(1)
REVENUE	1.235027	-6.099405***	-2.699199	-6.083909***	I(1)
GDP_PC	-1.282542	-7.462289***	-3.887457****	-15.19840***	I(1)
POP_G	-0.198851	-2.285837**	-0.739138	-1.937611*	I(1)

Note: *** sig at 1 percent, *** sig at 5 percent, and * sig at 10 percent.

The unit root tests were conducted using both the Augmented Dickey Fuller and Phillip-Peron Tests. The null hypothesis of unit-root was rejected for both the test at level and first difference if there is consensus from the ADF and PP test at 5 percent level of significance. In following this approach, all variable have been found to be stationary after taking the first difference and non-stationary at level.

5.3 Bivariate Model results

Since the study focuses mainly on the relationship between public debt and economic growth, a bivariate model was estimated to examine the optimal growth maximising public debt threshold. The Bivariate model was estimated using OLS regression and Instrumental variable regression due to possible endogeneity problem between economic growth and public debt. The results of the Bivariate Quadratic model of economic growth in Zambia are given in Table 6 below.

Table 6 Bivariate Model (GDP and DEBT)

Dependent : GDP	OLS regression	IV regression	Conclusion
DEBT	0.232766** (0.071156)	0.432858*** (0.157592)	Significant in both OLS and IV regression
DEBT2	-0.002786* (0.001381)	-0.005903** (0.002535)	Significant in OLS regression only
Constant	1.256196 (1.005913)	-0.298158 (1.116854)	
F-Stat	4.604540**	5.1764833***	Models are significant
R-squared	0.218178	0.131557	

Endogeniety Test: Diff in J-Stats = 2.902890 p = 0.0884

The IV Regression results are preferred to the OLS results due to the presence of Endogeneity between GDP and Debt at 10% level of significance as indicated by the test above. A one period Lagged public debt variable was used as the instruments in this IV regression. The coefficient for the debt-to-GDP ratio shows that for every percentage point

increase in the debt-to- GDP ratio, the growth rate of GDP rises by 0.43%.The estimated coefficient of debt-squared in the estimated growth equation was found to be negative and significant, implying that the results could be plotted on a public debt-growth scatter plot to determine the optimal public debt threshold via a graphical test. The model is a long-run co-integration equation since there is co-integration between GDP and debt. (**See Appendix A**). Therefore, residuals from the IV regression where obtained and plotted against debt. Figure 4 below shows the results of this graphical test.

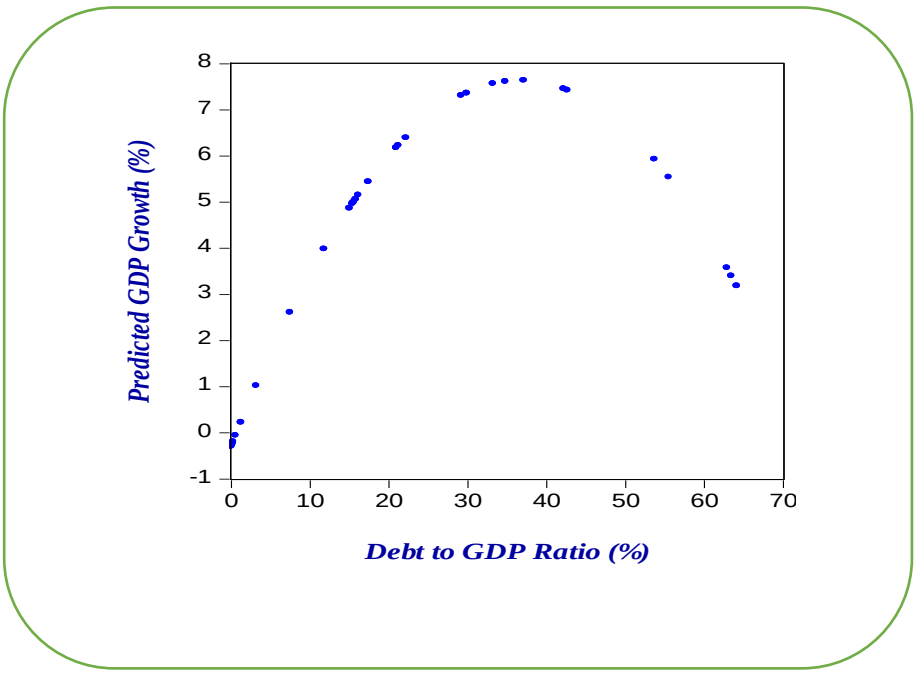


Figure 4 results of the graphical test

Source: Computed by the author using debt and GDP values

The figure above was obtained after plotting the predicted GDP values from the bivariate (IV model) against debt-to-GDP ratio. The plot assists in determining the existence of a Laffer-curve type relationship, where public debt contributes to economic growth up to a certain point (optimal threshold). After this point has been reached, further increases in public debt would start to have a negative effect on growth. The results also confirm the debt overhang hypothesis found with respect to the link between external debt and growth in low income countries (Cordella et al., 2010).The graphical test therefore suggests that the threshold value is 7.6 percent of GDP corresponding to 36.6 percent of Debt-to-GDP ratio. This was obtained after maximizing the results of the IV regression as follows:

$$\widehat{GDP} = -0.298158 + 0.432858debt_i - 0.005903debt^2$$

$$\frac{d(\widehat{GDP})}{d(debt)} = 0.432858 - 0.011806debt = 0$$

Hence:

$$debt = \frac{0.432858}{0.011806} = \mathbf{36.66}$$

5.5 Multivariate Model Results

The multivariate model was used to verify the optimal debt threshold by correcting the bivariate model for model specification problem (**see appendix A**). The Johansen test for cointegration on the multivariate model found evidence of long-run cointegration. The results of the tests are documented in the appendix. After allowing for other control variables in the model, the results of the Threshold autoregressive model of economic growth in Zambia are illustrated in Table 7.

Dependent Variable: GDP
Method: Threshold Regression
Threshold value used: 7.235599

Table 7 Multivariate Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1) < 7.235599 -- 26 obs				
C	-0.568693	0.837993	-0.678636	0.5044
DEBT	-0.004492	0.004891	-0.918361	0.3684
7.235599 <= GDP(-1) -- 7 obs				
C	0.433818	0.874287	0.496197	0.6247
DEBT	-0.099673***	0.011236	-8.870802	0.0000

Non-Threshold Variables

DEBT2	0.0000101	0.0000615	0.163445	0.8717
GDP_PC	1.037871***	0.009362	110.8643	0.0000
FDI	0.011340	0.015663	0.724019	0.4767
POP_G	1.056616***	0.246402	4.288172	0.0003
INF	-0.001187	0.002508	-0.473339	0.6406
EXCHP	0.001177	0.001715	0.686535	0.4995
REVENUE	0.00000000796**	0.000000000319	2.495835	0.0206

R-squared	0.998986	Mean dependent var	3.671076
Adjusted R-squared	0.998525	S.D. dependent var	4.239064
S.E. of regression	0.162820	Akaike info criterion	-0.531141
Sum squared resid	0.583228	Schwarz criterion	-0.032305
Log likelihood	19.76383	Hannan-Quinn criter.	-0.363298
F-statistic Prob(F-statistic)	2166.874 0.000000	Durbin-Watson stat	1.992758

The multivariate threshold autoregressive model reveals that for the Zambian case, the threshold value of GDP is 7.235599. This maximum value is then used in the calculations for the optimal-Debt Threshold as specified in the Bivariate Quadratic Model.

Calculating the optimal-Debt Threshold

$$\widehat{GDP} = -0.298158 + 0.432858debt_i - 0.005903debt^2$$

$$7.235599 = -0.298158 + 0.432858debt_i - 0.005903debt^2$$

$$0 = -7.533757 + 0.432858debt_i - 0.005903debt^2$$

Employing the quadratic formula

$$\boldsymbol{\gamma} = \frac{-0.432858 \pm \sqrt{0.432858^2 - 4(-0.005903)(-7.533757)}}{2(-0.005903)}$$

$$\gamma^* = \frac{-0.432858 \pm \sqrt{0.0094789778}}{2(-0.005903)}$$

$$\gamma^* = \frac{-0.432858 \pm 0.0973600421}{0.011806}$$

$$\gamma^* = \frac{-0.432858+0.0973600421}{-0.011806} \text{and} \frac{-0.432858-0.0973600421}{-0.011806}$$

$$\gamma^* = \frac{-0.335497957}{-0.011806} \text{and} \frac{-0.5302180421}{-0.011806}$$

$$\gamma^* = 28.4 \underline{\text{and } 44.9}$$

Solving this quadratic equation gives the optimal debt threshold values of 28.4 percent and 44.9 percent. Therefore the model shows that the effect of Public Debt on GDP turns from being insignificant to negative when GDP is around 7.24 percent. This implies the threshold value of debt-to-GDP ratio is between 28.4% and 44.9%, therefore, confirming the 36.6% value as the tipping point for Zambia.

Most of the control variables considered in the determination of economic growth have their hypothesized signs. The multivariate threshold autoregressive model reveals that for the Zambian case, debt has an insignificant effect on GDP below 28.4% of GDP and a significant negative effect once it goes beyond 44.9% of GDP.

5.6 Diagnostic Tests

To ascertain the goodness of fit of the TAR model, its applicability and inference in policy making, there is need to consider its statistical properties by performing diagnostic and stability tests. Table 8 documents the major diagnostic Test results which have been performed on the model.

Table 8: Diagnostic Tests

Test	Test Statistics	Conclusions
Normality Test	JB = 2.520084 (0.283642)	Residuals are Normal

BG Serial Correlation LM Test	Obs*R-sq = 0.08347 (0.959)	No serial correlation
Durbin-Watson Test	DW = 1.992758	No Serial correlation
BPG Heteroskedasticity Test	Obs*R-sq = 18.779 (0.0432)	Heteroskedasticity is present
Significance Test	F = 2166.874 (0.000)	Model is Significant
	R-SQAURED = 0.998986	
Ramsey Rest Test	F= 0.981031 (0.3332)	Model has no omitted variables

These results indicate that the estimated TAR Model was affected by heteroskedasticity as shown by the BPG Heteroskedasticity Test. The Model was, however, corrected for Heteroskedasticity using White Standard errors. The R-square of 0.998986 and the F-statistic of 2166.874 for model significance implies that the regressors in the model are adequately able to explain economic growth. Consequently, the Ramsey RESET test and the normality test suggest that there is no model specification error as there is no omission of variables since the residuals are normal.

5.7 Conclusion

The investigation of threshold effects of public debt on economic growth for Zambia has been very fruitful and intuitive. It has been revealed that a Laffer curve type of relationship exists after plotting the predicted GDP values from the bivariate (IV model) against debt-to-GDP ratio.The graphical test suggests that the threshold value is 7.6 percent of GDP corresponding to 36.6percent of Debt-to-GDP ratio. After allowing for control Variables and correcting the bivariate model for model specification problems, the multivariate threshold autoregressive model reveals that for the Zambian case, the threshold value of GDP was 7.235599. This implies the threshold value of debt-to-GDP ratio is between 28.4 percent and 44.9 percent. The model therefore validates the threshold value of 36.6 percent found after maximizing the IV regression.

CHAPTER SIX: DISCUSSION, POLICY IMPLICATIONS AND CONCLUSION

6.1 Introduction

A reasonable level of borrowing is anticipated to simultaneously boost capital accumulation and economic growth. However, extreme borrowing could be inimical to growth.The central focus of this study was to determine the turning point, below which public debt contributes to growth and beyond which debt hurts growth, a point usually referred to as the optimal growth-maximising debt threshold level. This chapter presents a summary of all the major findings and policy implications of the results. It has been organized into two sections: section 6.2 gives a summary of empirical results and the discussion. Policy implications and recommendations are in section 6.3 and section 6.4 is the conclusion section.

6.2 Summary of Empirical Results and Discussion

This study estimated the optimal growth-maximizing public debt threshold for Zambia by examining the link between public debt and growth. The study was taken on to establish the tipping point beyond which public debt negatively affects economic growth. The paper tested for the presence of a Laffer-curve type of relationship, where the influence of public debt on growth is theorized to be positive at lower levels and negative at higher levels. A bivariate quadratic econometric model was applied to fit a non-linear relationship between public debt and economic growth. The multivariate Threshold autoregressive model was used to verify the optimal debt threshold by correcting the bivariate model for model specification problems. The paper augments the economic discourse on the association between public debt and growth in determining the optimal public debt thresholds in low-income countries (LICs).

The results confirm the existence of an inverted U - shaped or Laffer-curve type of relationship between debt and growth based on data spanning the period 1980 to 2015. The optimal public debt level was estimated to be around 28.4 – 44.9% of debt-to-GDP for Zambia. Several other studies show that the threshold can be a range of values and not just a single value (See Greenidge et al., 2012 and Bilan & Ihnatov, 2015). Particularly, the optimal growth-maximising public debt threshold for Zimbabwe was estimated at a public debt-to-GDP ratio of between 45 and 50% (Mupunga & Le Roux, 2015). As such, it can be settled that the 36.6% threshold value from maximizing the bivariate model is within the stipulated range of 28.4 and 44.9% of the Debt-to-GDP ratio.

When debt is below 28.4%, it has not effect on GDP and when it goes beyond 44.9% the effect turns negative on growth. A study by Greenidge et al. (2012) also revealed that debt could have no effect on growth at a given level. The actual tipping point has been estimated to be 36.6% of debt-to-GDP ratio through maximizing the bivariate IV regression model results. This threshold value is very close to 38 % of GDP that was estimated in Namibia (Zaaruka, 2007).

The results obtained in this paper are consistent with the debt overhang hypothesis found in the analysis of the relationship between debt and economic growth. The findings in this paper complement the theoretical expositions by Reinhart and Rogoff (2010), Caner et al. (2010), Kumar and Woo (2010) and Mupunga and Le roux (2015). Given that the data employed covers a timeline spanning over 30 years and that the key variables in the model are significant, Zambia must make sure that the size of its public debt is managed taking into account this growth-maximizing public debt threshold.

Most empirical studies in the area of debt and its impact on growth have been cross-sectional in nature, therefore restricting country specific analysis. Furthermore, it is worthy noticing that the estimated growth maximizing threshold value of public debt estimated in this research is significantly different from the Public debt threshold level of 60 percent of GDP calibrated by the IMF for a group of low income countries to which Zambia is a part (Nalishebo & Banda, 2018). The public debt thresholds calibrated by the IMF is mainly meant to determine borrowing limits from the IMF and other concessional funds. This limit seeks to prevent the build-up of unsustainable debt without much concern about the prospects of economic growth. Additionally, there exits an even higher public debt threshold level ranging between 90% and 100% for countries in the catchment of the Macroeconomic and Financial Management Institute of Eastern and Southern Africa (MEFMI) (Mupunga & Ngundu, 2018).

The growth maximizing public debt threshold estimated in this research is uniquely specific to Zambia. This study believes that issues concerning the optimal level of debt for an economy must be country-specific. Several other researchers have sought to establish growth maximizing public debt thresholds specific to their respective countries (see Mupunga & Le roux, 2015; Eboreime and Sunday, 2017; Kumara and Cooray, 2013 and Zaaruka, 2007). All

the country specific threshold values of public debt significantly differed from the IMF calibrated debt thresholds.

It has been established in this research that Zambia's economic growth prospects are affected by the country's public debt levels. It has also been established that the growth-maximizing public debt threshold exists. The existence of the growth maximizing threshold is common in the field of economics. One of the reasons as to why debt thresholds arise is the Debt overhang problem (Mupunga & Le roux, 2015). In this case, high levels of debt discourages investment as investors in the country fear that their profits will be taxed away in order to service the debt and this hinders economic expansion. With the rise of debt levels in Zambia, There seems to be more concerted effort to broaden the tax base and expand the trap of potential levies to generate additional government revenues. In addition, the possibility exists that increasing debt levels heightens investors' uncertainty about government policies and therefore acts as a disincentive to investment, thereby, impairing growth in an economy.

A retrospective examination of Zambia's debt profile indicates that the growth maximizing public debt threshold of 44.9 percent was exceeded in 2015 from the time of the HIPC completion point. This state of high indebtedness is not without considerable economic costs, such as reduced private investments and rising sovereign credit risk, both of which are bad for economic growth. In 2017, the International Monetary Fund (IMF) Debt Sustainability Analysis (DSA) indicated that Zambia was at high risk of debt distress (IMF, 2017). And in 2018 Zambia became part of 25 low income countries that are considered to be at high risk of debt distress (Nalishebo & Banda, 2018).

6.3 Policy, Implications and Recommendations

The plain intimation from the results obtained in this paper is that Zambia should aim to maintain a public debt-to-GDP ratio that does not hamper growth by implementing debt-management policies that move its public debt trajectory towards the 44.9 % threshold. This means that adequate policy action is needed to ensure that the nation will not continue registering high levels of indebtedness coupled with lower growth rates in the future.

It is also prudent for government to target public debt levels below the calibrated optimal threshold of 44.9 % of GDP to cater for recessionary periods in the business cycle or to

provide a safety margin against potential macroeconomic shocks. In fact, it is observed that the stock on public debt in the last few years has been skewed more towards external debt expansion, leaving the government with greater exchange risk due to fluctuations in foreign exchange rates. This external debt situation in Zambia today remains a source of serious concern. External debt grew from US$1.9 billion (8.4% of GDP) at end-2011 to US$8.0 billion (36.5 % of GDP) at end-2016 (World Bank Group, 2017). If the kwacha weakens, as it did in 2015, then external debt (borrowed in foreign currency, mostly US$) becomes a bigger burden, since the government needs a greater amount of kwacha to acquire the US dollars needed to make debt service payments. The Zambian government must seek to reduce borrowing in foreign currency or seek to borrow more from internal sources. Domestic debt issuance is desirable in that it reduces the exchange rate risk associated with reliance on external borrowing.

Since the Threshold model found that there is no significant relationship between debt and growth before the tipping point, Zambia should ensure that debt financing below the optimal threshold is used for growth enhancing activities and not financing government non-capital expenditures. All borrowed resources ought to be used astutely to generate sufficient returns to pay off the debt and its accumulated interest. If this is cautiously observed, public debt would positively impact growth below the optimal threshold. In addition, Part of the borrowed funds should be invested to encourage export-oriented growth to help generate adequate foreign exchange to meet external debt obligations.

Strengthening Public debt and Investment Management is crucial in ensuring that borrowed money is used in an effective manner. Government debt management requires a combination of financial market and public policy skills. The skills needed include portfolio management and risk analysis, transaction processing, public policy skills and an understanding of basic macroeconomics. Debt managers must also have access to legal advice and guidance to ensure that the transactions they undertake are conducted per relevant domestic and international securities laws, and that decisions are made in accordance with public sector laws such as public debt and fiscal responsibility laws (Nalishebo & Banda, 2018).

To help Zambia reverse the high risk of debt distress, and aim to maintain it below the estimated growth-maximizing public debt threshold, Zambia must firstly halt the pace at which debt is accumulating. Beyond the immediate task of reducing the excessive debt,

thought should be given to the adoption of preventive measures to avoid unsustainable public debt in the future. The government of Zambia must evaluate the non-concessional loan channel and see how best non concessional loans can be minimized. Plans must also be devised to reduce the cost of borrowing, and extend maturities, by buying back some of the outstanding Eurobond debt in the years prior to their maturity.

6.4 Conclusion

This paper makes several contributions. First, it presents a simple theoretical model and underscores the principles necessary to derive growth-maximizing public debt ratios. Secondly, on the basis of empirical evidence, the paper estimates the growth-maximizing public debt threshold for Zambia. The estimates suggest that the government should target debt levels of around 36.6% of GDP in order to achieve maximum growth. Overall, the paper provides the first theoretically-based, country-specific estimate of the debt ratios that governments should try to maintain if they wish to maximize growth. Having defined or estimated optimal debt ratios for the purposes of maximizing growth in Zambia, different policy alternatives that ensure these debt targets are achieved have been recommended. This topic is left for further research as it has more to do with appropriate institutions involved in the management of debt in Zambia. Furthermore, the obtained threshold effect of public debt on economic growth reinforces the point that government borrowing must be done not only on terms that are consistent with debt sustainability, but also on terms that yields growth dividends to the country in the long run.

REFERENCES

AFRODAD. (2015). *Zambia Country Debt Profile. Harare.* Harare.

Ayres, R., & Warr, B. (2010). *The Economic Growth Engine: How useful work creates material Proserity*.

Baglan, D., & Yoldas, E. (2013). *Government debt and macroeconomic activity: a predictive analysis for advanced economies*. Federal Reserve Board Discussion Series 2013-05 Washington, DC: Federal Reserve Board.

Begg, D., Fischer, S., & Dornbusch, R. (2003). *Economics.* (Seventh Edition ed.). Berkshire: McGraw-Hill Education.

Bilan, I., & Ihnatov, I. (2015). *Public Debt and Economic Growth; A two-Sided Story.* International Journal of Economic Science , Vol. iv (No. 2), 24-39.

Cecchetti, G., Mohanty, S., & Zampolli, F. (2011). *The real effects of debt* . BIS Working papers No 352.

Checherita-Westphal, C., & Rother, P. (2010). *The Impact of High and Growing Government Debt on Economic Growth: An Empirical Investigation for the Euro Area.* ECB WorkingPaper No. 1237. European Central Bank .

Chileshe, P., & Longa, K. (undated). *The effects of fiscal policy on the conduct and transmission mechanism of monetary policy in Zambia.* Lusaka: Comesa Monetary Institute.

Chizonde, B. (2016). *The Macroeconomic Determinants Of Economic Growth in Zambia: Do Copper Prices Matter?* Dar es Salaam: Munich Personal RePEc Archive.

Chudik, A., Mohaddes, K., Paseran, H., & Raissi, M. (2015). *Is there a Debt threshold effect on output growth?* Cambridge: IMF.

Chongo, B. (2015). *An Econometric Analysis of the Impact of Public Debt on Economic Growth: The case of Zambia*

Cordella, T., Ricci, L., & Ruiz-Arranz, M. (2010). '*Debt overhang or debt irrelevance?* IMFS taff Papers, 57(1).

Daka, L., Kapena, S., & Fandamu, H. E. (2017). *The Impact of External Debt on Zambia's Economic Growth: An ARDL Approach.* Kitwe: Journal of Economics and Sustainable Development.

Eboreime, M., & Sunday, B. (2017). *Analysis of Public Debt-Threshold Effect on Output Growth in Nigeria.* Econ World Paris.

Egert, B. (2013). *The 90% Public Debt Threshold: The Rise and Fall of a Stylised Fact.* Munich: CESifo Group.: CESifo Working Paper 4242.

Greenidge, K., Craigwell, R., & Drakes, L. (2012). *Threshold Effects of Sovereign Debt: Evidence*

from the Caribbean. IMF Working Paper, WP/12/157 .

Hansen, B. (1999). *Threshold effects in non-dynamic panels: Estimation, testing, and inference.* Journal of Econometrics , 345-368.

Herndon, T., Ash, M., & Pollin, R. (2013). *Does High Public Debt Consistently Stifle Economic Growth? A Critique of Reinhart and Rogoff.* Working Paper Series No. 322. Amherst MA: Political Economy Research Institute, University of Massachusetts.

IBRD. (1998). *Appraisal of The Second High Way Project Zambia.*

Ismaila, M., & Imoughele, L. (2015). *Macroeconomic Determinants of Economic Growth in Nigeria: A Co-integration Approach.* International Journal of Academic Research in Economic and Management Science .

Khan, M., & Senhadji, A. (2001). *Threshold Effects in the Relationship between Inflation and Growth,.* IMF Staff Papers , Vol. 48.

Krugman, P. (1988). *Financing vs. forgiving a debt overhang.* Journal of DevelopmentEconomics , 253–268.

Kumara, H., & Cooray, N. (2013). *Public Debt and Economic Growth in Sri Lanka: Is there any Threshold leve for Public Debt?* International University of Japan: Economics and Management Series .

Lee, S., Park, H., Seo, M., & Shin, Y. (2016). *Testing for a Debt-Threshold Effect on Output Growth.* Fiscal studies. John Wiley & Sons Ltd , Vol. 38 (no. 4), 701-717.

Maghyereh, A., Omet, G., & and Kalaji, F. (2005). *External Debt and Economic Growth in Jordan: The Threshold Effect.,* Faculty of Economics and Administrative Sciences, The Hashemite University, Zarka Jordan.

Mankiw, G. (2009). *Macroeconomics.* New york: Worth Publishers.

Matiti, C. (2013). *The Relationship Between Public Debt and Economic Growth in Kenya.* International Journal of Social Sciences and Project Planning Management, 1 (1), . , Volume 1 (issue 1), 65-86.

Mbulawa, S. (2015). *Determinants of Economic Growth in Southern Africa. Development Community:* The Role of Institutions. Gaborone , Botswana.

McPherson, M. (2004). *The historical context. In Promoting and Sustaining Economic Reform in Zambia.* Cambridge, Massachusetts: Harvard University Press.

Minea, A., & Parent, A. (2012). *Is high public debt always harmful to economic growth? Reinhart and Rogoff and some complex nonlinearities.*

Mupunga, N., & le Roux, P. (2015). *Estimating the optimal growth-maximising public debt threshold for Zimbabwe.* Southern African Business Review , 102-128.

Mupunga, N., & Ngundu, T. (2018). *Growth Maximizing Public Debt Thresholds for Countries in Eastern and Southern Africa.* The MEFMI Research and Policy Seminar Journal (1), 26-46.

Nalishebo, S., & Banda, F. (2018). *Reversing Zambia's high risk of debt distress. Working Paper No.31.* Lusaka: Zambia Institute for Policy Analysis and Research.

Ndambiri, H., Ritho, C., Ng'ang'a, S., Kubowon, P., Mairura, F., P, N., et al. (2012). *Determinants of economic growth in Sub-Saharan Africa: A panel data approach.* Pretoria: Center for Environmental Economics and policy in Africa.

Nhu, P., Tung, L., & Vy, N. (2015). *Identity Threshold in the Relationship Between Public Debt and Economic Growth: The case of Developing Countries.* Vietnam: Faculty of Business Administration, Ton Duc Thang University.

Omotosho, B., Bawa, S., & Doguwa, S. (2016). *Determining the Optimal Public Debt Threshold for Nigeria.* CBN Journal of Applied Statistics , Volume 7 , No. 2 .

Phiri, A. (2013). *Inflation and Economic Growth in Zambia: A Threshold Autoregressive (TAR) Econometric Approach.* Munich Personal RePEC Archive .

Reinhart, C., & Rogoff, K. (2010). *Growth in a time of debt',* American Economic Review: Papers and Proceedings , (2), 573–578.

Romer, D. (1996). *Advanced Macroeconemics.* . USA: Mc Graw-Hill.

Siddique, R., & Malik, A. (2001). *Debt and Economic Growth in South Asia*. The Pakistan Development Review , Vol. 40 (No. 4), 677-688.

Snelson, P. (1990). *Educational Development in Northern Rhodesia, 1883-1945.*Lusaka. Lusaka: Kenneth Kounda Foundation.

Tuffour, J. (2012). *External Debt Threshold and Economic Growth Loss in Ghana.* Humberside Journal of Social Sciencesol. 1 No. 1, .

UNCTAD. (2005). *Managing public debt* . Washington, DC.

Whitworth, A. (2012). *Creating and Wasting Fiscal Space: Zambian Fiscal Performance, "2002 - 2011".* Lusaka: ZIPAR Working Paper.

Whitworth, A. (2013). *Explaining Zambian Poverty: A History of (non-agriculture) Economic Policy since Independence"*.

World Bank Group. (2017). *Zambia Economic Brief: How Zambia can Borrow without Sorrow.* Washington, DC: The International Bank for Reconstruction and Development/THE WORLD BANK.

WorldBank. (2002). *Zambia privatization review: facts, assessment and lessons.* Lusaka, Zambia: Report prepared at the request of the Minister for Finance and National Planning, mimeo.

WorldBank. (1977). *Zambia—a basic economic report. Report 1586b-ZA,*. Washington DC.

Zaaruka, B. (2007). Public Debt and Economic Growth in Namibia: The Threshold effect. *MEFMI* (1).

Appendix A: Tables of Tests and Results

A: Johansen Cointegration Tests (Bivariate Model)

Series: GDP DEBT DEBT2

Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.566229	39.61025	29.79707	0.0027
At most 1	0.276684	12.88260	15.49471	0.1192
At most 2	0.075656	2.517487	3.841466	0.1126

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.566229	26.72765	21.13162	0.0073
At most 1	0.276684	10.36511	14.26460	0.1891
At most 2	0.075656	2.517487	3.841466	0.1126

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

B: Johansen Cointegration Tests (Multivariate Model)

Series: GDP DEBT DEBT2 GDP_PC FDI POP_G INF EXCHP REVENUE

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.957038	421.6270	197.3709	0.0000
At most 1 *	0.945331	320.9088	159.5297	0.0000
At most 2 *	0.904021	227.9022	125.6154	0.0000
At most 3 *	0.853092	152.9061	95.75366	0.0000
At most 4 *	0.718533	91.53181	69.81889	0.0004
At most 5 *	0.527645	50.96414	47.85613	0.0248
At most 6	0.391963	26.96338	29.79707	0.1025
At most 7	0.280201	11.04278	15.49471	0.2089
At most 8	0.016171	0.521712	3.841466	0.4701

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.957038	100.7182	58.43354	0.0000
At most 1 *	0.945331	93.00660	52.36261	0.0000

At most 2 *	0.904021	74.99615	46.23142	0.0000
At most 3 *	0.853092	61.37426	40.07757	0.0001
At most 4 *	0.718533	40.56767	33.87687	0.0069
At most 5	0.527645	24.00077	27.58434	0.1347
At most 6	0.391963	15.92060	21.13162	0.2295
At most 7	0.280201	10.52107	14.26460	0.1799
At most 8	0.016171	0.521712	3.841466	0.4701

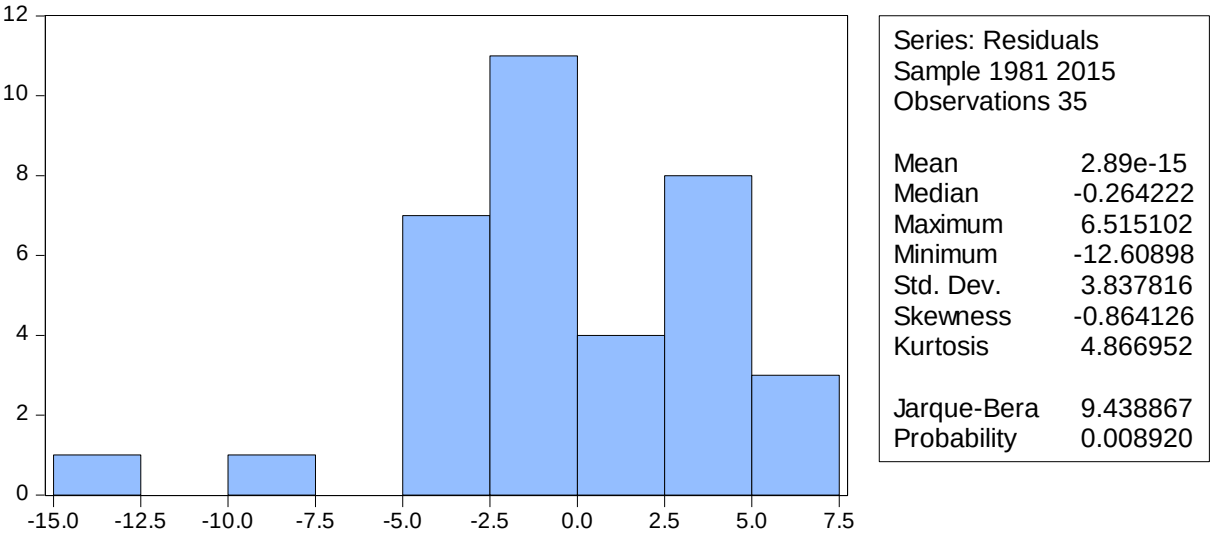
Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

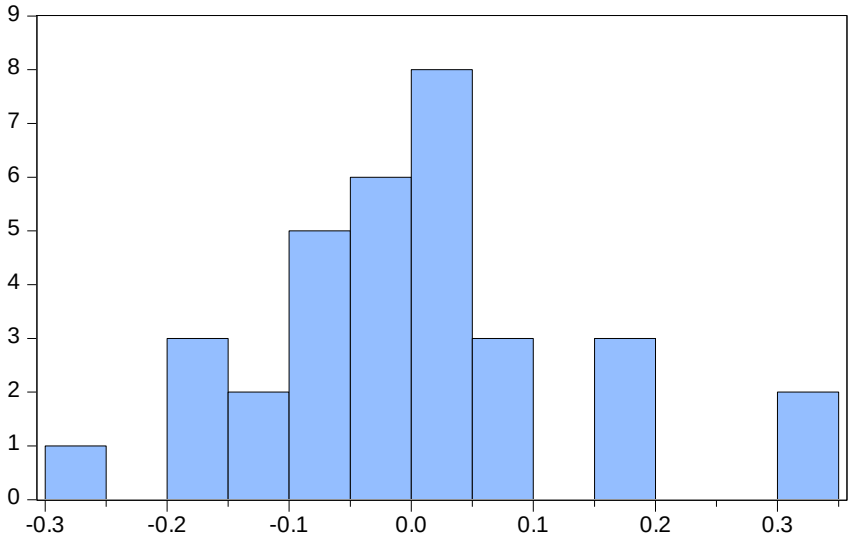
**MacKinnon-Haug-Michelis (1999) p-values

C: Normality Tests

Bivariate Model



Multivariate Model



Series: Residuals
Sample 1981 2013
Observations 33

Mean	1.60e-16
Median	-0.016536
Maximum	0.344658
Minimum	-0.293767
Std. Dev.	0.135003
Skewness	0.528815
Kurtosis	3.845108
Jarque-Bera	2.520084
Probability	0.283642

D: Other Diagnostics Tests (Multivariate Model)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.025358	Prob. F(2,20)	0.9750
Obs*R-squared	0.083470	Prob. Chi-Square(2)	0.9591

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.905230	Prob. F(10,22)		0.0177
Obs*R-squared	18.77929	Prob. Chi-Square(10)		0.0432
Scaled explained SS	11.87313	Prob. Chi-Square(10)		0.2936