THE EFFECT OF DEFENCE EXPENDITURE ON ECONOMIC GROWTH IN ZAMBIA 1988 TO 2015

BY

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A dissertation submitted to the University of Zambia in partial fulfillment of the requirements of the degree of Master of Arts in Economics

THE UNIVERSITY OF ZAMBIA

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DECLARATION

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ABSTRACT

The aim of this research was to investigate the effect of defence expenditure on economic growth as measured by real gross domestic product (GDP) in the presence of investment proxied by gross fixed capital investment, unemployment, lending rate, inflation proxied by consumer price index and labour growth rate in Zambia for the years 1988 to 2015. In this research, relationships and long-run effects of the independent variables aforementioned were analyzed. In addition to these variables, a number of other macroeconomic variables based on theory were included in the model, that is, exchange rate growth rate, imports growth rate and exports growth rate. Stationarity tests were carried out specifically on the variables used in the model. These tests were carried out using the Augmented Dickey Fuller (ADF) and the Philips-Peron tests. Further, the ARDL bound approach to co-integration was employed to determine the long run equilibrium relationship among the variables of the model. The findings indicated the existence of a significant long run relationship among the variables. The results further showed that military expenditure has no significant long run effect on economic growth, ceteris paribus. However, this relationship became significant for the short run. Specifically, the results indicated that a 1% increase in military expenditure would lead to a 0.30% decrease in economic growth, ceteris paribus. Finally, the -0.803153 ECM (-1) coefficient, which is the error correction mechanism coefficient, confirmed the existence of the long run relationship among the variables in the model at 5% level of significance. This indicated further that the departure from the long run growth path due to a certain shock is adjusted by 80.3% every period. As such, the Zambian government need to consider decreasing expenditure on defence, thus defence expenditure entertained a major opportunity cost on major development services in education and health.

DEDICATION

To my mother (my surviving parent) Mrs Emeldah Chipulu Malama Chapela, my wife Agatha Nakachima Bwalya and my sons Malama, Mwiinga & Munsha.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey Fullers Model
AR(l)	First order Autoregressive process
ARDL	Autoregressive Distributed Lag
CSO	Civil Society Organisation
ECM	Error Correction Mechanism
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
ICBM	Inter-Continental Ballistic Missile
MIC	Military Industry Complex
NGOs	Non- Governmental Organisations
OLS	Ordinary Least Squares
SIPRI	Stockholm International Peace Research Institute
SSA	Sub Saharan Africa
VAR	Vector Auto Regressive
VECM	Vector Error Correction Model
VIF	Variance inflation factor

CHAPTER ONE

1.0 INTRODUCTION

This chapter introduces the pros and cons of defence expenditure in relation to economic growth in Zambia, other Sub Sahara African (SSA) states and the world at large, and then it gives a brief background to Zambia's defence expenditure from the time of independence to date. Thereafter, the problem statement, research objectives, hypothesis and significance of the study are presented.

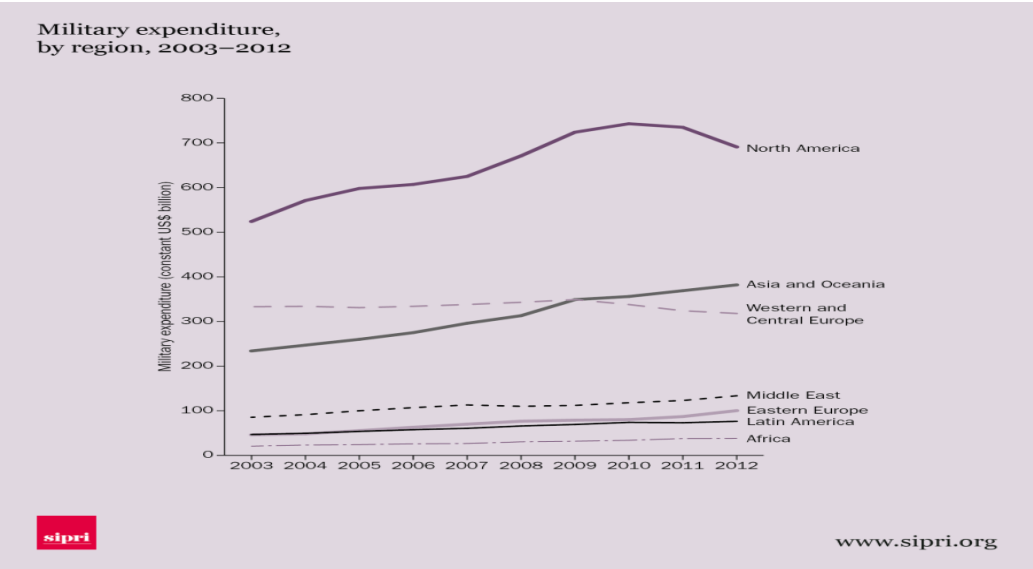
Defence expenditure is one aspect of any nation's expenditure which is never short of controversy. This controversy arises not only from the individual nations' increases in defence expenditure at the perceived expense of other vital socio-economic and infrastructure development areas, but also from the concerns of neighbouring countries and other nations with strategic interest conflicts. An increase in one country's defence expenditure usually leads to further increases in defence expenditures in other countries which may feel threatened hence also increase their defence expenditures in order to be ready to protect themselves or their strategic interests.

According to Tian et al (2016), while it is reasonable and prudent for a nation to make provision for security against external threats, one nation's security is likely to be another's insecurity. As a result, particularly in an atmosphere of hostility and suspicion, military expenditure assumes a competitive dynamic. The current state of affairs between North Korea and South Korea with its allies Japan and the United States of America (USA) attests to the assertion above. The continuous development and testing of inter-continental ballistic missiles (ICBM) as well as the testing of nuclear weapons by North Korea has seen Japan increase its military expenditure in terms of military equipment upgrades and routine exercises to protect itself and prepare the citizenly on safety in the event of an ICBM attack. On the other hand the USA has been increasing its deployment of troops and military equipment in the region to forestall an imminent attack on its mainland and also protect its interests in Japan and South Korea. In the same vein China has opposed the USA's deployment of the anti-missile defence systems in the region as it feels insecure and consequently has increased its surveillance in that direction.

In view of situations like the example above, military expenditure has been taking up a consistently significant portion of world GDP and consequently that of individual nations for a major part of the last twenty years. This is a major cause of controversy among critics of military expenditure who view it as an opportunity cost to development based expenditure. According to Tian N et al (2016) world military expenditure is estimated to have been $1686 billion in 2016, equivalent to 2.2 per cent of the global gross domestic product (GDP) or $227 per person. The 2016 estimate is a marginal increase of about 0.4 percent in real terms on 2015. After thirteen (13) consecutive years of increases (from 1998 to 2011), world military spending has continued to plateau with only minor decreases between 2011 and 2014 (an average of 0.7 per cent per annum) and slight increases in 2015 and 2016.

The same study further reviewed that military expenditure in North America saw its first annual increase (1.7 per cent) since 2010. Central, Eastern and Western Europe also recorded annual increases of 2.4, 3.5 and 2.6 percent, respectively. Asia and Oceania's spending rose by 4.6 per cent in 2016. By contrast, military spending fell in Central America and the Caribbean (–9.1 per cent), South America (–7.5 per cent), Africa (–1.3 per cent). Military expenditure in Africa as a whole fell by1.3 per cent to $37.9 billion in 2016.This was the second year of decrease after 11 consecutive years of increases dating back to 2003. Total spending in Africa, however, is still 48 per cent higher than it was in 2007. Figure 1 below shows the scenario depicted above for the period 2003 to 2012.

Figure 1: World Military expenditure trend 2003-2012



Source:www.sipri.org

Figure 1 above further shows that, while western countries continue to cut military spending amid austerity policies, no such phenomenon was seen in the rest of the developing world. Despite falls in GDP growth and investment, every region and sub-region outside the West continues to increase military spending (SIPRI, 2016). In view of the above, by 2011 it was established that Defence expenditure was one of the major components of National expenditure in Zambia averaging 1.8 percent of GDP in the previous three years (World Bank report, 2011). Zambia spent $319,000,000 on the military in 2012 which amounted to 1.6% of the country's GDP that year. Furthermore, Military expenditure as a percentage of GDP in Zambia was measured at 1.75% in 2015, according to the World Bank. The actual figure was $324,700,000, that is, Defence was 73% of the health budget of $446,400,000, 56% more than the support given to agriculture's $207,600,000 and 58% of road infrastructure budget of $562,700,000. To the contrary, Health spending continues to fall short of the Abuja declaration of 15% and will not help the achievement of MDGs.

This trend ranks Zambia's defence expenditure among the highest in Africa. In terms of defence expenditure as a percentage of GDP Zambia even surpasses much bigger economies like Nigeria and South Africa. Table 1 below shows military expenditure as a percentage of national expenditure for selected sub Saharan African countries from the year 2007 to 2016. Though the percentages maybe misleading as national expenditures of the countries differ greatly, it also clearly shows the high expenditure on defence in Zambia. According to Tian N (2015) this highlights that often considerations in defence spending are made outside economic conditions. In an environment where most developing governments have been pushing to increase GDP growth, foreign direct investment and to decrease poverty, many believe that continued pushes to raise military spending can be seen as counter-productive.

Table 1: Military expenditure by country as percentage of government spending, 2007-2016

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Zambia	8.3%	8.0%	8.1%	7.7%	6.7%	6.3%	5.7%	6.6%	6.2%	5.0%
Mozambique	3.0%	3.0%	2.7%	3.3%	2.8%	3.0%	2.9%	2.4%	2.8%	3.3%
Namibia	10.1%	11.2%	10.6%	10.6%	9.3%	9.0%	8.4%	10.4%	10.8%	10.1%
Zimbabwe	. .	. .	. .	4.6%	6.5%	8.9%	8.9%	9.2%	9.3%	8.4%
Tanzania	4.3%	3.8%	3.8%	4.5%	4.8%	4.7%	5.2%	5.9%	6.3%	5.7%
Rwanda	6.4%	5.8%	5.9%	5.1%	4.4%	4.3%	4.0%	4.2%	4.5%	4.6%
South Sudan	. .	. .	. .	. .	29.0%	27.7%	24.9%	24.7%	20.0%	7.4%
Sudan	20.9%	25.2%	29.0%	. .	. .	. .	. .	. .	21.7%	24.7%
Nigeria	2.0%	3.4%	3.3%	3.2%	3.2%	3.5%	3.6%	3.5%	3.8%	4.1%
South Africa	4.3%	4.0%	3.8%	3.5%	3.6%	3.6%	3.6%	3.5%	3.3%	3.2%

Source: World Bank national accounts data, and OECD National Accounts data files.

1.1 Background

Zambia was one of the first few countries in Southern Africa to become independent following her independence on 24th October, 1964. The country has since that time been at peace except for a period of minor political insurgency from the Mushala Rebellion in North-Western Province which lasted from 1975 to 1982. Subsequently, the nation committed itself to help other countries in the region attain independence and internal peace. In this quest, it provided residence to refugees and assistance to the liberation movements from countries such as South Africa, Southern Rhodesia (now Zimbabwe) and South West Africa (now Namibia). The country also found itself being affected by civil strife from its neighbouring countries, that is, Angola, Mozambique and Zaire (now Democratic Republic of Congo). Belligerent parties in these conflicts accused Zambia of taking sides in their internal matters. This implied that the country put itself in the line of fire from the colonial governments and warring parties in these countries.

Therefore, the nation had to put up a strong military to deter would be invaders and also be ready to defend itself against such elements. This reaction to the eminent threat could have been at the expense of economic development. The foregoing justified the huge defence expenditure in the seventies (1970s) and early eighties (1980s). Other than these reasons, this was also the time when there was a cold war and Zambia like most developing countries was caught up in it. In fact, most developing countries' imports of weapons placed a huge burden on their economies, through using scarce foreign

exchange. According to Grobar *et al.* (1990) arms imports in the early 1980s accounted for almost 10% of the imports of all developing countries. This may be offset by military related aid, exports of arms and import substitution, but in general, military spending is likely to be a burden on the trade balance. In addition, evidence suggests that military related debt in developing countries is substantial and that the financial burden of earlier arms imports via debt service has grown over time (Brzoska, 1983). However, from the late eighties to the end of the research period the vast majority of defence expenditure in Zambia went on current expenditure, particularly personnel costs, rather than on capital equipment or arms. The scenario currently seems to be reverting to the earlier days of capital expenditure.

1.2 Problem statement

Despite experiencing minor decreases between 2011 and 2014, the last three decades have generally seen an increase in defence expenditure in developing countries and Zambia has not been an exception. This expenditure in Zambia is seen through the recent acquisition of modern military equipment and aircraft while the country has a substantial amount of external financing in the national budget. Consequently, in Zambia it is widely believed that this defence expenditure is a waste of national resources on a nonproductive sector more especially that the country has never experienced war. This is evidenced from the debates in the Zambian National Assembly by Parliamentarians among them the one on 6th March 2008 which tackled the necessity of Government buying military fighter jets for the Zambia Air Force (http://www.parliament.gov.zm/node/1749). On the other hand, Civil Society Organisations (CSOs) also condemned the decision as wasteful given the economic state of the country. Furthermore, the increase in defence expenditure has made it come into close proximity to expenditure on health, education and infrastructure while surpassing expenditure on agriculture. This definitely has potential to stifle economic growth, especially in an economy were expenditure on cardinal sectors continues to fall short of the MDGs.

Arising from the expenditure increase, a number of studies on the impact of defence expenditure on economic growth in developing countries have been done and most have confirmed increased defence expenditure. Even though this increase in military expenditure has aroused great interest among defence economists, few studies have been devoted to the empirical underpinnings of country-specific data on the impact of military expenditure on economic growth (Anyanwu S et al, 2011). According to Egwaikhide and Ohwofasa (2009), the bulk of the existing studies have focused on cross-sectional research, often bedeviled with data discrepancies.

Therefore, this research will contribute to understanding by seeking to establish whether the current increased defence expenditure has a positive, negative or insignificant effect on economic growth in Zambia as a developing country both in the short run and long run.

1.3 Research Objectives

1.3.1 Study objective

The objective of this research is to determine the effect of Zambia's defence expenditure on economic growth in the presence of investment and labour growth rates as well as economic factors such as unemployment, real exchange rate, real imports, real exports, inflation rate and lending interest rates.

1.4 Hypotheses

H_0 - Defence expenditure stimulates GDP growth in Zambia.

H_1 - Defence expenditure has no effect on economic growth in Zambia

1.5 Significance of the study

Zambia is a poor country with perennial budget deficit problems. This implies that the efficient allocation of its scarce financial resources among competing needy areas is cardinal for its social and economic development. Therefore, the resources spent on defence have an opportunity cost of being spent on other sectors such as health, education, agriculture, poverty reduction programmes, investments and infrastructure development. Thus this is fundamentally a resource allocation problem that requires economic attention.

Therefore, this research will endevour to contribute new empirical information on the important relationship between defence expenditure and economic growth in Zambia which could be useful for future research and policy consideration. Furthermore, it will contribute to the literature on this public finance topic given that it is still sparse in developing countries.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the theoretical propositions on defence expenditure and the empirical review of literature on the impact of defence expenditure on economic growth from all over the world. Thereafter, a summary is made of the studies.

It is worth noting that the economic study of defence expenditure and its effect on economic growth is a fairly new field of economic study. Consequently, there are a number of disagreements among economists regarding the theory applicable in different situations. The above notwithstanding, it is important to have a theoretical model for empirical work, but since most economic theories do not have an explicit role for military spending there is no obvious choice. Indeed, as there is no agreed theory of growth among economists, there is no standard framework to fit military spending into (Dunne,J.P and Tian, N .2013). In most recent empirical work some form of neoclassical growth model has been used, exogenous or endogenous, to provide a consistent and flexible framework for the analysis (Dunne et al, 2005). These will inevitably focus on particular aspects of the growth process and may miss complexities, such as the effect of institutions, natural resources, strategy, conflict.

2.1 Theoretical Propositions

According to Dunne (2000), there are three basic theoretical propositions on military expenditure being adopted in the literature on both developed and developing countries. These theories have allowed researchers to identify numerous channels linking military expenditure to economic growth and help theorise its potential effects. These are explained below.

2.1.1 Neoclassical Theory

This theory postulates that a state is a rational actor which balances the opportunity costs and security benefits of military spending in order to maximise a well-defined national interest reflected in a societal social welfare function. Military expenditure can be treated as a pure public good and the economic effects on military expenditure will be determined by its opportunity cost, the tradeoff between it and other spending (Dunne, 2000).

2.1.2 Keynesian Theory

This approach sees a proactive state which uses military spending as one aspect of state spending to increase output through multiplier effects in the presence of ineffective aggregate demand. In this way increased military spending can lead to increased capacity utilisation, increased profits and hence increased investment and growth. This theory has however been criticised for its failure to consider supply side issues, leading many researchers to include explicit production functions in their Keynesian models (for example, Deger and Smith, 1983).

An allied version is the **institutionalist theory** which provides a radical liberal approach which combines with a Keynesian perspective. It focuses on the way in which high military spending can lead to the development of a powerful interest group composed of individuals, firms and organisations, referred to as the military industrial complex (MIC) that benefit from defence spending. The MIC increases military expenditure through internal pressure within the state even when there is no threat to justify such expenditures. This usually results into industrial inefficiencies (Smith, 1977).

2.1.3 Marxist Theory

This approach sees the role of military spending in capitalist development as important though contradictory. There are a number of strands to the approach which differ in their treatment of crisis, the extent to which they see military expenditure as necessary to capitalist development, and the role of the MIC in class struggle. One offshoot of this approach has provided the only theory in which military spending is both important in itself and an integral component of the theoretical analysis, the under consumptionist approach. Developed from Baran and Sweezy (1966) this sees military expenditure as important in overcoming realization crises, that is, allowing the absorbtion of surplus without increasing wages and so maintaining profits. No other form of government spending can fulfill this role. While this approach has been extremely influential in the general economic development literature, empirical work within this approach has tended to be limited to developed economies.

2.2 Empirical Evidence

It is a common view among most economists that expenditure on the unproductive public sector slows down economic growth (Dreze, 2006). Nonetheless, regarding expenditure on National defence, there is no general consensus as the exact opposite and midway arguments take center stage.

Various empirical studies have been done on the effect of defence expenditure on economic growth. The results are quite diverse. Some indicate that defence expenditure impacts positively on economic growth while others indicate that defence expenditure impacts negatively on economic growth yet others indicate that defence expenditure insignificantly impacts on economic growth. However, more recent studies provide increasingly stronger evidence of a negative effect of military expenditure on growth. Below some of these studies are highlighted in the order of those that found a positive relationship, a negative relationship and finally an insignificant relationship.

2.2.1 Studies that found a positive effect of defence spending on economic growth

The pioneering arguments on this subject are that public expenditure on defence boosts economic growth (Benoit, 1973; 1978). The debate in the empirical literature on the impact of military spending on economic growth started with the contribution of Benoit (1978) who analyzed the correlation for 44 less developed economies and concluded that defence spending has a positive impact on economic growth. There were two responses to this. One criticized Benoit's approach, arguing that the complexities and specificities of the underlying processes call for detailed, individual country case studies. The second argued that the empirical work was flawed. This led to considerable research activity using econometric analysis to overcome the deficiencies, most of which has tended not to support Benoit (Dunne, 2010). This study therefore undertakes to look at the detailed, individual country case of Zambia.

Hassan et al. (2003), examined the impact of military expenditure on economic growth and foreign direct investment in five of the seven South Asian Regional Cooperation Council (SARCC) nations. He used panel data covering the period from 1980 to 1999. The result was that a positive relationship existed between military expenditure and economic growth. Given the different levels of economic advancement of the countries covered compared to Zambia, this study will show if the results still hold for Zambia.

Egwaikhide and Ohwofasa (2009) investigated the relationship between military expenditure and economic growth in Nigeria. They disaggregated Military expenditure into recurrent and capital components. The other variables they used were savings, investment and gross domestic product (GDP) as a proxy for economic growth. The results revealed a positive relationship existed in all

cases. The study at hand will not disaggregate military expenditure but it will be utilized as a whole and a comparison of the results will be made.

Safdari et al. (2010) investigated the impact of defence expenditure on economic growth in Iran. In their study, relationships of six variables GDP growth rate, the ratio of investment to gross domestic product, Growth of labor force, Direct impact of public sector, Direct impact of export and Direct impact of defence sector and also their influences on each other in Iran and for years 1975-2008 were analysed. For this purpose Vector Autoregressive model (VAR) was used. The results of this research showed that the variables of the ratio of investment to gross domestic product, Growth of labour force, direct impact of public sector, direct impact of export and direct impact of defence sector had positive effect on economic growth.

Tiwari and Shahbaz (2011) investigated the effect of defence spending on economic growth using Zivot and Andrews (1992) and Lee and Strazicich, (2003) structural unit root tests and ARDL bounds testing approach to cointegration in augmented version of Keynesian model for the Indian economy. Their analysis confirmed long run relationship between the variables and, results indicated positive effect of defence spending on economic growth. Granger causality analysis showed bidirectional causal relationship between defence spending and economic growth as probed by variance decomposition approach.

Anyanwu et al (2011) investigated the relationship between defence expenditure and economic growth in Nigeria. Gross domestic product (GDP) was used as a proxy for economic growth. In addition, a number of macroeconomic variables, which included exchange rate, inflation rate, lending rate, gross capital formation and unemployment, were included in the model. The period of Structural Adjustment Programme (SAP) was also included as a dummy variable to capture the impact of policy changes. They employed cointegration and vector error correction mechanism to model the series. Results showed that all the variables had a long run relationship, that is, a positive relationship existed between military expenditure and economic growth in the long run, as well as in the short run. Nigeria underwent economic reforms similar to those in Zambia. Therefore, this research was used as a basis for our study and though emphasis in this case will be on the effect as opposed the impact of defence expenditure on economic growth.

2.2.2 Studies that found a negative effect of defence spending on economic growth

Klein (2004), investigated the effects of military spending and economic grow in Peru. He applied a Deger type model to estimate the relationship. After some unit root testing and difficulties with estimation results from the different system, adjustments were made and the three equation models were estimated with OLS, 2SLS and 3SLS. The results were that a negative relationship existed between defense spending and economic growth in Peru.

Karagol and Palaz (2004), estimated the relationship between defence spending and economic growth proxy by gross domestic product (GDP) for Turkey covering the period from 1955 to 2000. They applied Granger Causality technique for estimation. They also used impulse response functions to indicate long-run causality. The result was that defense expenditure had a negative impact on GDP in Turkey.

Dunne (2010) did an empirical analysis of the effect that military spending has had on the economies in the Sub Sahara African (SSA) region. He did a brief review of the empirical literature for developing countries, which suggested that there was little or no evidence for a positive effect on economic growth and that it was more likely to have a negative effect, or at best no significant impact at all. A growth model based on Dunne et al (2006), which includes military spending and overcomes some of the limitations of earlier models, was then estimated on a panel of countries using SIPRI, IFS and World Bank data for 1988-2006. This found unequivocal negative impacts of military spending on growth for SSA, consistent with the results for all developed and non- developed countries.

Brasoveanu (2010) analysed the relationship between defence expenditure and economic growth in Romania. The study focused on finding out the existence, direction and intensity of this connection. The methods used were cluster analysis, quintile analysis, regression technique and Granger causality. The results suggested that in Romania there is a negative correlation. A potential cause of the negative effect of defence expenditure on economic growth in Romania is the high proportion of the spending on equipment and other operational spending.

Dunne, J.P and Tian, N. (2013) examined the impact of military expenditure on economic growth on a large balanced panel, using an exogenous growth model and dynamic panel data methods for 106 countries over the period 1988-2010. A major focus of the paper was to consider the possibility group heterogeneity and non-linearity. Having estimated the model for all of the countries in the panel and

finding that military burden had a negative effect on growth in the short and long run, the panel was broken down into various groupings based upon a range of potentially relevant factors and the robustness of the results was evaluated. The factors considered were different levels of income, conflict experience, natural resources abundance, openness and aid. The estimates for the different groups were remarkably consistent with those for the whole panel, providing strong support for the argument that military spending had adverse effects on growth. These results are consistent with those found by Tian (2015) in his PHD thesis. In conclusion, however, they observed that there are some intriguing results that suggest that for certain types of countries military spending has no significant effect on growth. Below are studies which also found this outcome.

2.2.3 Studies that found an insignificant effect of defence spending on economic growth

Solomon (2005) investigated the demand for military spending in Canada. He employed distributed lag approach to carry the investigation. The results revealed that the most important determinant of military spending in Canada was the European North Atlantic Treaty Organization (NATO) spending and that the relationship between Economic growth proxied by gross domestic product (GDP) and military spending was insignificant.

Pieroni (2009) argued that the relationship between military spending and economic growth may be non-linear and provide different results as compared to traditional approaches in defence literature. In a study by Wijeweera and Webb (2011), a panel co-integration approach was used to examine the relationship between military spending and economic growth in the five South Asian countries (namely India, Pakistan, Nepal, Sri Lanka and Bangladesh) for the period of 1988–2007. Wijeweera and Webb (2011) found that a 1% increase in military spending increases real GDP by only 0.04% and hence they concluded that the substantial amount of public expenditure that is currently used for military purposes in these countries has a negligible impact on economic growth.

What is clear is that past research has not been able to provide consensus on the economic effects of military spending, though more recent studies do seem to be providing more consistent support for a negative effect of military spending on growth (Dunne and Tian, 2013).Therefore, the foregoing findings leading to different relationships between defence expenditure and economic growth may be explained, especially in the less developed countries, by the fact that on the positive side defence expenditures have beneficial effects on economic growth, by engaging in research and development, providing technical skills, educational training and generating an infrastructure necessary for

economic development (Benoit, 1978). Also on the negative side that defence expenditures crowd-out private investment, by distorting resource allocation and diverting resources from productive ventures to unproductive activities (Shahbaz et al, 2011). The main sources of study-to-study variation in the findings of military expenditure and economic growth literature are attributable to the sample, time periods, and functional forms. Furthermore, the more recent cross country studies have also showed increasing concern over group heterogeneity, endogeneity and non-linearity. Examples could are countries' experience of conflict, economic freedom and governance.

Subsequent to the foregoing contributions this study analyzed relationships and long-run effects of the independent variables of interest specific to Zambia.

CHAPTER THREE

HOW DEFENCE EXPENDITURE AFFECTS THE ECONOMY

3.0 Introduction

This chapter starts with the definition of defence expenditure adopted in this research and one in the Zambian context then gives the role of the nation in defence expenditure before presenting how defence expenditure affects economic growth in general and particularly in Zambia.

3.1 Definition of defence expenditure

According to SIPRI (2012), defence or military expenditure is that part of government spending which includes all current and capital expenditures on the armed forces, including peacekeeping forces; defense ministries and other government agencies engaged in defense projects; paramilitary forces, if these are judged to be trained and equipped for military operations; and military space activities. Such expenditures include military and civil personnel, including retirement pensions of military personnel and social services for personnel; operation and maintenance; procurement; military research and development; and military aid (in the military expenditures of the donor country). Excluded are civil defence and current expenditures for previous military activities, such as for veterans' benefits, demobilization, conversion, and destruction of weapons.

On the other hand, in Zambia defence expenditure can be defined as that part of government expenditure accrued by the Ministry of Defence on its portfolio functions. According to the Ministry of Defence website (www.mod.gov.zm), the ministry is charged with the critical responsibility of preserving, protecting and defending the sovereignty and territorial integrity of Zambia for the sole purpose of ensuring the country, its citizens and residents are safe guarded from both internal and external aggression. The Ministry of Defence draws its mandate from the Government Gazette Notice No.547 of 2004, and is accordingly responsible for the following portfolio functions:

- National Defence Policy in accordance with the Constitution of Zambia Act Cap 1
- Zambia Defence Force (Zambia Army and Zambia Air Force) as guided by the Zambia Defence Act Cap 106

- Zambia National Service as guided by Zambia National Service Act Cap 121
- Home Guards as guided by Home Guard Act Cap 122
- Combined Cadet Force as guided by Combined Cadet Force Act Cap 118
- War Graves and Memorials as guided by War Graves and Memorials Act Cap179

3.2 The role of government in defence expenditure

According to Beattie (2012), Adam Smith one of the fathers of free market economics, identified the defence of society as one of the primary functions of government and justification for reasonable taxation. Basically, the government acts on behalf of the public to ensure that the military is sufficiently well resourced to defend the nation. In practice, however, defending the nation expands to defending a nation's strategic interests, and the whole concept of "sufficient" is up for debate as other nations also bulk up their military. Strategic interests explain the presence of United States military bases in most continents of the world and also the presence of various war ships belonging to big nations such as Britain, China and France on the Indian ocean adjacent to the African continent fighting piracy.

This entails that defence is a public good on which no citizen, group of citizens or private organization is ready to spend. Hence, it is Government's business to ensure the wellbeing and security of its people and its external interests. Additionally, government must provide pre-conditions for economic prosperity and ensuring the protection of such prosperity. The main premise underlying this proposition could be attributed to the Neo-classical theory described in chapter two above, that is, Government is a rational agent maximizing a welfare function. This entails that Government must provide a secure environment where locals are able to venture into economic activities without fear. Likewise, the Government will be able to attract Foreign Direct Investment (FDI) only if it can guarantee security of the foreign investments. FDI cannot be taken to countries which are war torn or have civil strife.

3.3 The effect of defence expenditure on economic growth

Defence expenditure other than its influence from the broad theoretical paradigms of Keynesian, Neoclassical and Marxist described above, affects economic growth directly through the following; crowding-in effect, crowding-out effect, spin off effect and spill out effect. These effects of military

expenditure on growth come from three channels, that is, the demand, the supply and the security channels.

Crowding-in effect: The demand channel suggests that military expenditure increases aggregate demand, employment (labour) and capital utilisation (investment) through the Keynesian multiplier effect, that is, the crowding–in effect. The military in Zambia is among the public institutions that employ a lot of people with huge numbers being recruited at a go.

Crowding-out effect: The supply channel considers the opportunity cost of military expenditure which is seen to be harmful. The trade-off between military needs and other productive activities commonly known as "guns versus butter" entails that military expenditure crowds out investment. Military expenditure also often leads to increased taxes and government debt which have a net effect of reducing growth. This is referred to as crowding-out effect. Military equipment such as fighter aircraft and their accompanying installations are extremely expensive hence they are bought on credit which increases the country's debt burden. Here, military expenditure is seen as a public good hence its economic effects are determined by opportunity costs. This competition for resources, namely, capital (e.g. physical and human), labour, technology and natural resources result in these being unavailable for civilian use. However, the resultant effect of military expenditure on the economy through the lens the neoclassical approach is still a lively debate. According to Tian (2015) crowding out of public and private investment, adverse balance of payment within arms importing countries, inefficient bureaucracies, fewer civilian services and R&D activities are just some of the possible opportunity costs associated with higher levels of military expenditure.

Spill-over effect: Military R&D may result in development of improved technologies with beneficial spillovers into the civilian sector this is called the spill-over effect. The development of internet which originated from the military for quick information transfer is now a critical component of civilian life.

Spin off effect: Infrastructure developed by the military sector that benefits the civilian sector, that is, the spin –off effect. The current inclusion of civil aviation facilities at Zambia Air Force Mbala base so that it can also be used for air movement by the civilian populace to and from the northern tourism sector of Zambia is an example of this effect.

On the other hand the security channel considers the role of military expenditure in providing security for people and properties from internal and external threats.

These effects work through various factors whose influences on economic growth through defence expenditure are explained here below.

3.3.1 Labour

Employment is considered to have the biggest part from the impact defence expenditure has on economic growth. This arises initially from the huge numbers of people employed as active troops and the training they undergo. According to Brasoveanu (2010), defence spending may increase the skill set of the population through training and education of military personnel. He further states that, it is often argued that expenditure on defence training in developing countries may contribute to improving the educational level of the labour force and may act as a stabilising influence in society.

Secondly, from a considerable infrastructure that is developed to sustain the troops and also ensure their efficient and effective operational capability which calls for more labour to be engaged into economic activity. This comes through consultants, contractors, tradesmen and handymen contracted in the process. Then there are a number of private businesses that are set up solely to capture military spending, such as military uniform and equipment suppliers, weapons manufacturers and small businesses that emerge near military bases.

3.3.2 Investment

Capital is a scarce resource. This implies that resources going into one spending category mean that there are fewer resources for another. However, capital expenditure on defence can have productive uses in the civilian economy as the private sector benefits from the positive externalities arising therefrom. These include transport networks, airfields, schools, hospitals and sports facilities that are originally constructed for military purposes.

Therefore, expenditure on defence production (employment and investment) as highlighted above has both positive and negative effects on economic growth. The positive effects are that defence expenditure increases employment of labour. Labour can be said to have a growth-stimulating effect if it moves the economy closer to full employment, creates human capital and promotes stability. On the other hand defence expenditure increases the utilization of capital; increases the rate of exploitation of available resources and provides infrastructure.

Additionally, the spirit of "militarism" may increase savings. Where the spirit of militarism is defined 'as a belief that a strong military force should be maintained and used aggressively to defend or promote national interests (www.Your Dictionary.com). In the first and second republics of Zambia

this was demonstrated by; the conscription of all form five school leavers and voluntary enlistment into a one year National Service programme through the Zambia National Service Act Chapter 121, the establishment of a force known as the Home Guard through the Home Guard Act Chapter 122 of 1957 as provided for in Act 32 of 1971 and Act 13 of 1994, and the subsequent introduction of Zambia National Service to enhance agricultural and small scale industrial production as well as skills training for the school drops.

While on the negative effects, it can also be argued that the public resources that are channeled to recruit and support military labour directly or indirectly takes away an equivalent or even bigger number of employment opportunities from the civilian economy due to the taxation needed to create them. Investment expenditure may also lead to higher inflation affecting growth via spending boom.

3.3.3 Inflation

Looney (1989) analyzed extended possible inflationary impacts of military spending and suggested two possible sources of greater inflation in arms producing states. First, military spending could result in cost-push inflation (inflation resulting from insufficient supply inputs) because the military bureaucracy continues to reward contractors that sustain substantial cost over-runs. Second, demand related inflation (inflation resulting from excessive demand) could result in an economy, already operating at full capacity, from the increased aggregate demand associated with increased government spending. Cost-push inflation could occur only in the producing states while demand related inflation would occur in either economy only if it was at full capacity. His final regression analysis shows that military spending restricts growth in non-producing states while enhancing it in producing states.

3.3.4 Unemployment

According to Hooker and Knetter (1994) the effect of military expenditure on unemployment is that changes in military procurement spending significantly affect unemployment especially in countries that heavily depend on the military sector.

3.3.5 Technology

The technological impact of Military expenditure on economic growth is mainly through the spill-over effects of military Research and Development (R & D) technology into civilian usage. From time past military research has benefited the private economy as technological leaps and talented people have always moved back and forth. Microwaves, Internet, Global Positioning Systems (GPS),

Drones and even jet engines are products of military research. Today we have drones taking photos at major public events and delivering packages because the expense of creating the basic technology was covered through military spending. According to Brasoveanu (2010), investment in the defence sector generates positive externalities for the civilian sector, like public infrastructure development, technology spillovers and human capital formation.

However, other scholars argue that defence spending has a negative impact on the economy because it diverts talent and technical skills towards supporting military research and development. There are definitely some distorting factors that military R&D has on research and technology, but the research spending isn't an entire loss for the economy as many of the breakthroughs do positively influence commercial technology.

3.3.6 External Factors (Threat)

The impact of defence expenditure on growth might be dependent on the threats posed by foreign countries and other external forces. Threats without defence expenditure would reduce growth; defence expenditure without threats would reduce growth, while defence expenditure in the presence of sufficiently large threats increases growth. This argument is supported by Aizenman and Glick (2006) who studied the long-run impact of military expenditure on growth. They concluded that military expenditure induced by external threats should increase growth, while military expenditure induced by rent seeking and corruption should reduce growth.

The positive effects of external factors or forces are that they provide security from outside threats that might discourage investment; Provide confidence in production and accumulation; act as a link with larger powers; are instrumental for the transfer of technology and provision of aid, both military and civilian. The negative effects are that military is often loyal to an imperialist power; military facilitates the transfer of surplus out of the country; although it attracts foreign aid, that aid may create more problems than it solves.

3.4 Structure of Military Expenditure in Zambia

The changes of Zambia's defence expenditure as a share of the country's GDP from the year 1988 to 2015 were as described in table 2 below.

Table 2: Military expenditure and Real GDP in Zambia 1988 to 2015

YEAR	REAL GDP (US$)	MILITARY EXP % GDP
1988	3713614458	2.326184992
1989	3998637681	4.195269403
1990	3285217391	3.723310394
1991	3378882353	2.554108151
1992	3181921788	2.955769676
1993	3273237853	1.561882115
1994	3656647744	1.719245351
1995	3807067122	1.451688393
1996	3597220962	1.051809549
1997	4303281932	1.007661035
1998	3537683046	1.256387626
1999	3404311977	1.648318463
2000	3600683040	1.573021878
2001	4094480988	1.285374234
2002	4193845678	1.654327852
2003	4901839731	1.598673262
2004	6221077675	1.580899606
2005	8331870169	1.674406236
2006	12756858899	1.613645798
2007	14056957976	1.652418863
2008	17910858638	1.552422316
2009	15328342304	1.441530462
2010	20265556274	1.382592765
2011	23460098340	1.317606823
2012	25503370699	1.357852118
2013	28045460442	1.359739114
2014	27150646860	1.633868395
2015	21154394546	1.753234112

Source: World Bank, Zambia development indicators 1960 - 2015

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This chapter starts with the presentation of the model specification and describes the type and source of data used in the research in respective sections below, then proceeds to outline the estimation procedure which is the methodology used to conduct the research in section 4.3.

4.1 Model Specification

The econometric approach that was used in this research is a single equation analysis adopted from the model developed by Deger (1986) and used by Anyanwu (2011), in which they emphasized the structural simultaneity of all the variable relationships. The variables adopted in this study are not all the same as those used by Anyanwu but have been selected due to their relevance to the Zambian context. The functional form of the model that we have adopted in the model is therefore as follows:

rgdp = f(mil exp, gfc, lf ,reer, rexp, rim, inf, unemp, lendr) ………………….. (1)

In log stochastic form, equation (1) can be rewritten as:

$$lnrgdp = \beta_0 + \beta_1 lnmil\_exp + \beta_2 lngfc + \beta_3 ln\ lf + \beta_4 lnreer + \beta_5 lnrexp + \beta_6 lnrimp + \beta_7 lninf\_cp + \beta_8 lnunemp + \beta_9 lnlend\_ir + \mu \quad \ldots\ldots (2)$$

Where:

rgdp = Gross Domestic Product (measure for economic growth)

mil_exp = Military Expenditure

gfc = Gross Fixed Capital Investment

lf = Labour Force

reer = Real Exchange rate of the Kwacha to US Dollars

rexp = Real Exports

rimp = Real Imports

inf_cp = Inflation rate

unemp = Unemployment

lend_ir = Lending rates

β_0 = Intercept

$\beta_1 - \beta_9$ = other parameters to be estimated and

μ = the error or residual term that is supposed to satisfy the usual econometric assumption and it is assumed to be normally distributed.

Since this study will adopt the ARDL approach, the variables above were presented as shown in equation 5.

4.2 Type of Data

This study involved the use of secondary time series data covering the period of study, that is, from 1988 to 2015. For data on Gross Domestic Product (GDP), gross fixed capital Investment, real effective exchange rate and Labour growth rates the global development finance data base of the World Bank for 2016 was used while for military expenditure the SIPRI data base for 2016 was used.

4.3 Estimation Procedure

Before running the estimations, post-estimation tests were carried out, such as, heteroscedasticity test, autocorrelation, and normality test using Jarque-Bera. The ARDL cointegration was done which confirmed the existence of long run relationship among the variables. Using the main cointegration equation in determining the long run dynamics of the model, individually all the covariates of interest were tested for statistical not different significance. Furthermore, a regression estimation using Ordinary Least squares (OLS) of the lagged values of log of GDP growth on the lagged log of military expenditure, inflation, lending rates, unemployment, real imports, real exchange rates and gross fixed capital formation was done in Eviews 9 in determining the short run relationship.

4.3.1 Unit Root Test

Stationarity tests were carried out specifically on the variables that were used in the model. This was through carrying out tests for the presence of unit roots. These tests were carried out using the Augmented Dickey Fuller (ADF). Adopting the simple economic relationship of random walk with drift, the DF test is based on the following equation:

$$\Delta X = \alpha + \beta X_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Under the null hypothesis of unit root, the coefficient of X_{t-1} will not be statistically different from zero, that is, if there is no unit root, the series X_t is said to be stationary in levels or integrated of order zero (denoted as I(0)). If there is a unit root, but differencing the series once makes it stationary, then it is said to be integrated of order one (denoted as I(1)) . In addition to testing for the unit root, equation (3) is used to establish if there is a drift. The error term, μ_t, should be white noise. If, X_t is a first order autoregressive process (AR(l)), then the single lagged value of the variable will be sufficient to ensure this condition. If the process is not AR(1), then additional difference terms will need to be added to equation (3) is used to make μ_t white noise hence, the Augmented Dickey-Fuller (ADF). The ADF test is therefore based on the equation below:

$$\Delta X = \alpha + \beta X_{t-1} + \sum_{j=1}^{p} + \delta_{t-j} X_{t-1} + \mu_t \ldots\ldots\ldots (4)$$

The null hypothesis of non-stationary is rejected if the t-statistic is less than the critical t-value (i.e. if estimated â is significantly negative).

4.3.2 Cointegration Test

In time series one of the objectives is to investigate the long run dynamics relationship among the variables. Subsequently, the ARDL bound approach was used. The method involves estimating the following model.

$$\Delta LNRGDP_t = \alpha_1 + \alpha_T T + \alpha_{RGDP} LNRGDP_{t-1} + \alpha_{MIL\_EXP} LNMIL\_EXP + \alpha_{GFC} LNGFC_{t-1} + \alpha_{LF} LNLF_{t-1} + \cdots + \alpha_{LEND\_IR} LNLEND\_IR + \sum_{i=1}^{p} \alpha_i \Delta LNRGDP_{t-i} + \sum_{j=0}^{q} \alpha_j \Delta LNMIL\_EXP_{t-j} + \sum_{k=0}^{r} \alpha_k \Delta LNGFC_{t-k} + \cdots + \sum_{m=0}^{t} \alpha_m \Delta LNLEND\_IR_{t-m} + \varepsilon_{1t}$$

…… (5)

Where the variables are as described in section 4.1 but with the lags.

CHAPTER FIVE

EMPIRICAL ANALYSIS AND PRESENTATION OF RESULTS

5.0 Introduction

This chapter offers an in-depth presentation of estimation techniques, results and discussion of the empirical findings of the study. The chapter gives a detailed synopsis of time series properties, descriptive statistics, pre-estimation tests, such as, Augmented Dickey Fuller Test (ADF), cointegration test, heteroscedasticity test, autocorrelation test and the normality test respectively.

A discussion whether the expected results are ascertained will be engaged before the conclusion to bring the distinct strands of the discussion together.

5.1 Descriptive Statistics

Following the Jarque Bera statistic value and the associated probability values in table 3 below, all variables were stationary except for military expenditure and real exchange rate.

Table 3: Descriptive Statistics

	LN RGDP	LN MIL EXP	LN GFC	LNLF	LN REER	LN REXP_ GDP	LN RIMP_ GDP	LN INF_CP	LN UNEMP	LN LEND _IR
Mean	22.68	0.52	21.54	15.33	0.29	3.43	3.54	3.20	2.58	3.39
Median	22.17	0.46	21.77	15.36	1.28	3.41	3.53	3.08	2.62	3.44
Maximum	24.06	1.43	23.03	15.70	2.16	3.70	3.85	5.21	2.98	4.73
Minimum	21.88	0.01	20.25	14.91	-4.80	3.17	3.23	1.86	2.03	2.25
Std. Dev.	0.82	0.33	0.88	0.22	1.95	0.16	0.14	1.00	0.31	0.60
Skewness	0.57	1.29	-0.08	-0.15	-1.45	0.22	0.14	0.54	-0.57	0.03
Kurtosis	1.59	4.44	1.58	2.05	3.90	2.11	3.30	2.29	2.11	2.39
Jarque-Bera	3.83	10.23	2.38	1.15	10.80	1.15	0.20	1.95	2.47	0.44
Prob	0.15	0.01	0.30	0.56	0.005	0.56	0.90	0.38	0.29	0.80

5.2 Diagnostic tests

The model was subjected to diagnostic tests before the actual estimation was done. Below in table 4 are the diagnostic tests.

Table 3: Diagnostic tests

Test	Test method	Test statistic	Observed Value	P-Value	Conclusion
Normality	Histogram	Jarque-Bera	1.239928	0.5380	Normally Distributed
Heteroscedasticity	Breusch-Pagan-Godfrey	Chi-Square	17.87848	0.3965	Homoscedastic
Serial Correlation	Breusch-Godfrey	Chi-Square	0.126751	0.7218	No serial correlation

5.2.1 Normality Test

H_0: The residules are normally distributed

H_1: The residules are not normally distributed

Following from the Jarque-Bera statistic of 1.2399 and the associated P-value of 0.538, the now hypothesis could not be rejected at a 5% level of significance. This implies that the residuals are statistically normally distributed.

5.2.2 Heteroscedasticity

H_0: The residuals are homoscedasticity

H_1: The residuals are heteroscedasticity

This study employed the Breusch-Pagan-Godfrey test of heteroscedasticity. The chi-square value, at 17 degrees of freedom, of 17.878 with and associated p-value of 0.3965 suggests that the residuals are statistically homoscedastic at 5% and other conversional levels of significance (1% and 10% levels).

5.2.3 Serial Correlation

To test for the serial correlation of the residuals, this study employed the Breusch-Godfrey serial correlation LM test. Following from the Chi-square value of 0.126751 with its associated p-value of 0.7218 for the Breusch-Godfrey test, there is statistically no significant serial correlation in the model at all conversional levels of significance (1%, 5%, and 10% levels)

5.2.4 CorrelationTest Analysis

The presence of collinearity is not a problem but the degree of association among variables is what is crucial. According to Gujarat (2006) argues that any correlation from 0.8 downwards is fine but any association above 0.8 depicts perfect collinearity which is a serious problem. Therefore real exchange rate and labour force were dropped due to perfect collinearity. The rule of the thumb is that if entries exceed 0.9 then there is multicollinearity, in this case, there is no value that exceeds 0.9. The conclusion is therefore that there is no multicollinearity in the model.

Table 4: Collinearity Test

```
. corr rgdp lf reer mil_exp_gdp rexp_gdp rimp_gdp inf_cp unemp lend_ir gfc_actual
(obs=28)
```

	rgdp	lf	reer	mil_ex~p	rexp_gdp	rimp_gdp	inf_cp	unemp	lend_ir	gfc_ac~l
rgdp	1.0000									
lf	0.8762	1.0000								
reer	0.7460	0.9576	1.0000							
mil_exp_gdp	-0.2992	-0.5164	-0.4793	1.0000						
rexp_gdp	0.8120	0.5895	0.4577	-0.0536	1.0000					
rimp_gdp	0.3564	0.4391	0.4912	-0.1421	0.3805	1.0000				
inf_cp	-0.5137	-0.7007	-0.7132	0.6474	-0.2394	-0.2340	1.0000			
unemp	-0.7834	-0.8398	-0.7928	0.4718	-0.3630	-0.3599	0.7254	1.0000		
lend_ir	-0.6395	-0.5677	-0.5515	-0.0499	-0.4674	-0.1915	0.6367	0.6569	1.0000	
gfc_actual	0.8783	0.7522	0.6428	-0.2082	0.8127	0.6353	-0.3559	-0.6303	-0.4973	1.0000

The rule of the thumb is that if the coefficient of correlation is above 0.81 then there exists perfect collinearity, and the problem is that the estimator might be blue but the precision of the estimator is in question (Gujarat, 2009). As per the rule of the thumb, real exports and labour force are perfectly collinear and violates the rule and concludes that multicollinearity is a problem. The remedial measure is to drop the collinear variables. Therefore, as in the appendices, the coefficients of correlation remained within the degrees where multicollinearity was not problematic.

5.3 Unit Root Test

Stationarity test is mostly ascertained by the Augmented Dickey Fuller (ADF) test and the Philip Peron stationarity test (PP). Wooldridge (2007) argues that time series observations are said to be stationary when the variance is constant and is not determined by time. If a regression is carried out with non-stationary data spurious results are realized and such results cannot be reliable for inference. The unit root test was conducted to determine whether the series were stationary of not. The optimal lag for all the variables was one and this lag was used for the unit root test. Two methods were used, the Augmented Dickey Fuller and the Philips Peron unit root tests. Both methods produced similar results.

Table 5: Unit Root Test Results at Levels

Variable	ADF Statistics	ADF Order of Integration	PP Statistics	PP Order of Integration
LNRGDP	0.101952	I(1)	-0.090180	I(1)
LNMILEXP	-1.966330	I(1)	-1.919770	I(1)
LNGFC	0.783930	I(1)	0.577285	I(1)
LNLF	0.632476	I(1)	-1.574049	I(1)
LNREER	-7.059938	I(0)	-6.126844	I(0)
LNREXP_GDP	-1.480072	I(1)	-1.443503	I(1)
LNRIMP_GDP	-1.595991	I(1)	-1.595991	I(1)
LNINF_CP	-0.936759	I(1)	-0.840587	I(1)
LNUNEMP	-0.971648	I(1)	-0.940128	I(1)
LNLEND_IR	-1.115434	I(1)	-1.199065	I(1)

*Notes: (i) McKinnon critical values are used for rejection of hypothesis of a unit root. (ii) Critical values for ADF and PP statistics are -3.699871, -2.976263 and -2.627420 at 1 percent, 5 percent and 10 percent Significance level respectively. (Where *** mean significant at 10 percent, ** significant at 5 percent and * significant at 1 percent).*

At their levels, only the natural log of Real Exchange Rate (LNREER) was found to be stationary, therefore LNREER is I(0). The rest of the variables had to be differenced once for them to be stationary. This implies that all the other variables of the model are I(1). The table 7 below shows the results of the Unit root test of the first difference of the variables which were non-stationary at their levels. The results shows that the first difference of the I(1) series became I(0).

Table 6: Unit Root Test Results at First Difference

Variable	ADF Statistics	ADF Order of Integration	PP Statistics	PP Order of Integration
D(LNRGDP)	-3.690059**	I(0)	-3.799739***	I(0)
D(LNMILEXP)	-6.634526***	I(0)	-6.536648***	I(0)
D(LNGFC)	-4.339707***	I(0)	-4.330505***	I(0)
D(LNLF)	-4.330411***	I(0)	-4.322991***	I(0)
D(LNREXP_GDP)	-5.795549***	I(0)	-5.795549***	I(0)
D(LNRIMP_GDP)	-5.420347***	I(0)	-5.434112***	I(0)
D(LNINF_CP)	-5.585153***	I(0)	-7.131624***	I(0)
D(LNUNEMP)	-4.950991***	I(0)	-5.410020***	I(0)
D(LNLEND_IR)	-4.644599***	I(0)	-4.644599***	I(0)

*Notes: (i) McKinnon critical values are used for rejection of hypothesis of a unit root. (ii) Critical values for ADF and PP statistics are -3.711457, -2.981038 and -2.629906 at 1 percent, 5 percent and 10 percent Significance level respectively. (Where *** mean significant at 10 percent, ** significant at 5 percent and * significant at 1 percent).*

5.4 Optimal Lag Selection Criteria

The selection of the maximum lags to which was used in time series models is determined by several criteria, such as, Akaike Information Criterion (AIC), Hannan Quinn Information Criterion (HQIC), Schwartz's Bayesian Information Criterion (SBIC), Log Likelihood (LL), Likelihood Ratio (LR) and Final Prediction Error (FPE) the method. The method with a common reported lag order designated by the stars is taken as the order of estimation. Due to limited sample size, E-views 9 only accepted a lag of 1. Hence the lag of 1 was adopted based on the Schwartz's Bayesian Information Criterion.

Table 7: Optimal Lag Selection Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	83.40273	NA	0.000000	-5.437239	-4.957300	-5.294528
1	395.9166	370.3868*	4.96e-22*	-21.17901*	-15.89967*	-19.60918*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

5.5 Cointegration Test

This study used the ARDL bound test to test for co-integration among the variables of the model. This approach was adopted because the sample size was not very large and because the involved series were a combination of the I(0) and I(1). Table 9 below shows the results of the ARDL bound test to co-integration.

Table 8: ARDL Bound Test to Co-integration

Critical Value bound of the F-statistic								
	10 percent level		5 percent level		2.5 percent level		1 percent level	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
K = 9	1.88	2.99	2.14	3.3	2.37	3.6	2.65	3.97
Dependent Variable			F-Statistic			Co-integration		
$\boldsymbol{LNRGDP_t}$			$F_{LNRGDP} = 3.942552$			Yes		

The results are significant at 2.5% level of significance. This indicates that there is a significant long run equilibrium relationship among the variables of the model. This was arrived at because the observed F value of 3.94 is greater than the upper bound critical value of 3.6.

5.6 Estimating the Long run results

The long run results in table 10 below indicate that military expenditure has no significant effect on economic growth at all conversional levels of significance (1%, 5%, and 10% levels of significance). However, some of the control variables indicated a significant effect on economic growth. Gross fixed capital investment and real export have a significant positive long run effect on economic growth at 10% level of significance and 1% level of significance, respectively. Specifically, in the long run, a 1% increase in gross fixed capital investment would lead to a 1.14% increase in economic growth, ceteris paribus.

Table 9: Long Run Estimation

Dependent Variable: LNRGDP
Selected Model: ARDL(1, 1, 1, 0, 1, 1, 0, 1, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	154.727724	102.216162	1.513731	0.1644
LNMILEXP	-0.269951	0.448578	-0.601792	0.5622
LNGFC	1.143921*	0.556215	2.056617	0.0699
LNLF	-10.566252	7.493337	-1.410086	0.1921
LNREER	0.663498	0.551357	1.203392	0.2595
LNREXP_GDP	3.873501***	1.084215	3.572632	0.0060
LNRIMP_GDP	-0.298324	0.588038	-0.507322	0.6241
LNINF_CP	-0.708982	0.397236	-1.784790	0.1080
LNUNEMP	-1.224899**	0.452629	-2.706187	0.0241
LNLEND_IR	-0.712240	0.807301	-0.882248	0.4006

R-squared	0.925190	Schwarz criterion	-1.260719
Adj R-squared	0.783882	Durbin-Watson stat	1.350135
F-statistic	6.547344	Prob(F-statistic)	0.003491

*Where *** mean significant at 1 percent, ** significant at 5 percent and *** significant at 1 percent*

Similarly, a 1% increase in real exports would lead to a 3.87% increase in economic growth in the long run, ceteris paribus. On the other hand, unemployment was found to have a significant negative long run effect on economic growth at 5% level of significance. Specifically, all things equal, a 1% increase in unemployment would lead to a 1.22% decrease in economic growth in the long run.

5.7 Estimating the Short run results

In the short run, military expenditure was found to have a significant negative effect on economic growth. Specifically, a 1% increase in military expenditure would leads to a 0.30% decrease in economic growth at in short run at 5% level of significance. Similarly, real exchange rate and real imports have a significant negative short run effect on economic growth at respective 5% and 1% levels of significance. Specifically, a 1% increase in real exchange rate would lead to a 0.23% decrease in economic growth, ceteris paribus.

Table 10: Short Run Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.136427*	0.074706	1.826185	0.0865
D(LNMILEXP)	-0.300402**	0.136849	-2.195142	0.0433
D(LNGFC)	-0.046823	0.169873	-0.275633	0.7864
D(LNLF)	-0.347449	2.093556	-0.165961	0.8703
D(LNREER)	-0.234569**	0.090133	-2.602483	0.0192
D(LNREXP_GDP)	1.101588***	0.347150	3.173232	0.0059
D(LNRIMP_GDP)	-0.725152***	0.246677	-2.939686	0.0096
D(LNINF_CP)	0.085173	0.068807	1.237842	0.2336
D(LNUNEMP)	-0.289457	0.188785	-1.533265	0.1447
D(LNLEND_IR)	-0.077561	0.095886	-0.808885	0.4304
ECM(-1)	-0.803153**	0.280950	-2.858702	0.0114
R-squared	0.773346	Schwarz criterion		-1.006720
Adjusted R-squared	0.631687	Durbin-Watson stat		1.984929
F-statistic	5.459210	Prob(F-statistic)		0.001409

*Where *** mean significant at 1 percent, ** significant at 5 percent and *** significant at 1 percent*

A 1% increase in real imports would lead to a 0.73% decrease in economic growth, ceteris paribus. On the other hand, a 1% increase in real exports would lead to a 1.10% increase in economic growth at 1% level of significance, ceteris paribus. The -0.803153 ECM (-1) coefficient, which is the error correction mechanism coefficient, confirms the existence of the long run relationship among the variables in the model at 5% level of significance. The results indicate further that the departure from the long run growth path due to a certain shock is adjusted by 80.3% every period.

5.8 Discussion of the Findings

This study sought to determine the effect of military expenditure on economic growth of Zambia. Several other variables were included in the model to form a multivariate framework. Additional variables include unemployment, real exchange rate, real import, real export, inflation rate, and lending rate. The study employed the ARDL bound approach to cointegration. This was because the unit root test reviewed results which were a combination of I(0) and I(1) series, and that the sample size was small.

The results indicated a significant long run equilibrium relationship among the variables of the model. These findings are consistent with Tiwari and Shahbaz (2011) in India. The long run results of the model reviewed that military expenditure has an insignificant effect on economic growth of Zambia in the long run. These results are consistent with the findings of Solomon (2005) on the Canadian economy who also used a distributed lag approach, and Wijeweera and Webb (2011) on the five south Asian countries. The null hypothesis of no effect on economic growth as a result of expenditure being made on military could not be rejected. This implies that military expenditure has no significant long run effect on economic growth for the Zambian economy.

The short run results of this study indicated that military expenditure has a significant negative effect on economic growth, and these results are consistent with the findings of Tian (2015), Klein (2014) in Peru, Dunne and Tian (2013), Karagol and Palaz (2010) in Turkey, Dunne (Feb, 2010) in the Sub Sahara Africa, and Brasoveanu (2010) in Romania. This implies that the null hypothesis of no effect on economic growth was statistically rejected at 5% level of significant. Hence, in the short run, Zambia's military expenditure has a significant effect on economic growth, and following the sign of the coefficient, the effect is negative.

However, both the short run and long run results of this study are contrary with the findings of Hassan et al (2003) on SARCC, Egwaikhide and Ohwofasa (2009) in Nigeria, Safdari et al (2010) in Iran, and Tiwari and Shahbaz (2011) in India.

CHAPTER SIX

6.0 CONCLUSION

The results above show that the impact military expenditure had on the growth rate of GDP between 1988 and 2015 was not statistically significant in the long run, but statistically significant in the short run. The coefficients for the short run and long run were both negative. This therefore indicates that military expenditure has an adverse effect on economic growth in the short run, and as such is important for consideration in a nation in the allocation of scarce national. Given that military expenditure has an inverse relationship with the growth in GDP, government should be reducing expenditure on military as it has a reduction effect in the growth of the Zambian economy. Subsequently, sectors that are growth enhancing should receive the share of resource allocation that has been going towards military expenditure. This can also be attributed to the fact that the country has been enjoying relative peace with no major external threats. Hence, increased military expenditures is likely to hinder the effective allocation of national resources to other sectors of the economy, and hence lead to a regressive growth of the economy. Despite defense expenditure not being excessive and remained within the prescribed norms for a developing country, it has been growth inhibiting for Zambia.

6.1 Policy Implications and recommendations

The Zambian government may consider decreasing expenditure on defence given that the estimated coefficient was negative and significant in the short run, thus defence expenditure entertained a major opportunity cost on major development services in education and health. The expenditure on military could be reduced by decreasing the number of military personnel recruited and limiting the procurement of immediate war equipment and weapons to stimulate economic growth through increased allocation to other growth enhancing sectors. Also, a decrease in expenditure through capital projects though necessary to the military which have negative externalities to the entire economy. Examples such as the upgrading of the Zambia Air Force Mbala Air base into an international airport by incorporating civilian aircraft movement facilities could be the way to go a long way in allowing private participation in the management of Mbala air base hence reducing expenditure to military. This development is scheduled to open up the northern region of Zambia and the northern sector of tourism which will grant tourists easy access to places like the Kalambo falls,

Lake Chila and Motomoto museum all of which have potential to increase economic activity in the area. This is because tourism has been identified as the main stay and potential to economic growth. This shows that government may still consider allocating resources for military expenditure in the long run because despite showing a negative a priori sign, the long run results were insignificant and as such cannot inform government's decision not to procure military equipment. In the long run, the government also need to consider expanding the levels of real export and policies that could boost gross fixed capital investment. Creating of Jobs can also help boost economic growth.

6.2 Limitations

There was a challenge in collecting of information on defence expenditure from local sources, hence the use of data from SIPRI.

There was further lack of information on the productivity and viability of the industries that are involved in defence hardware production. Therefore, it was not possible to take into account the production and exports if any from the defence sector.

6.3 Need for Further Research

It is recommend that further studies need to be conducted on the relationship between military expenditure and economic growth for the Zambian economy by use of local data sources, data on defence industries production and increased sample size.

APPENDICES

A1: Data Set

YEAR	RGDP (Million)	GFC (Million)	LF (Million)	REER	Mil_ exp_ GDP	REXP_GDP	RIMP_GDP	INF_ CP	Unemp	Lend_ IR
1988.000	3713.614	1085.380	2.988	0.008	2.326	30.236	32.251	51.004	17.613	18.390
1989.000	3998.638	922.835	3.209	0.014	4.195	32.908	34.743	123.404	18.042	18.390
1990.000	3285.217	970.026	3.403	0.030	3.723	28.787	31.180	107.024	18.471	35.104
1991.000	3378.882	635.995	3.484	0.065	2.554	30.401	33.540	97.642	18.900	63.486
1992.000	3181.922	620.692	3.574	0.172	2.956	28.458	30.924	165.707	19.329	54.567
1993.000	3273.238	779.923	3.668	0.453	1.562	29.655	32.629	183.312	19.700	113.308
1994.000	3656.648	658.815	3.775	0.669	1.719	32.950	33.700	54.601	18.565	70.558
1995.000	3807.067	796.771	3.882	0.864	1.452	32.901	36.326	34.930	17.432	45.533
1996.000	3597.221	941.784	3.990	1.208	1.052	28.479	35.343	43.073	15.000	53.783
1997.000	4303.282	1071.185	4.106	1.314	1.008	27.371	30.902	24.419	13.523	46.692
1998.000	3537.683	1358.476	4.230	1.862	1.256	24.618	31.633	24.458	12.000	31.800
1999.000	3404.312	1646.338	4.357	2.388	1.648	25.037	34.730	26.788	12.477	40.517
2000.000	3600.683	2065.660	4.489	3.111	1.573	23.924	36.464	26.030	12.930	38.800
2001.000	4094.481	2704.155	4.604	3.611	1.285	25.110	39.559	21.394	13.719	46.233
2002.000	4193.846	3029.736	4.724	4.399	1.654	27.134	37.783	22.233	12.723	45.198
2003.000	4901.840	3545.871	4.847	4.733	1.599	25.684	36.629	21.402	15.471	40.571
2004.000	6221.078	3425.996	4.975	4.779	1.581	33.540	37.273	17.968	15.514	30.727
2005.000	8331.870	3507.909	5.109	4.464	1.674	30.611	31.590	18.324	15.900	28.209
2006.000	12756.859	3803.661	5.154	3.603	1.614	32.593	25.264	9.020	14.274	23.153
2007.000	14056.958	4419.767	5.196	4.003	1.652	33.591	32.180	10.657	12.117	18.889
2008.000	17910.859	4952.982	5.236	3.746	1.552	28.919	30.536	12.446	7.900	19.063
2009.000	15328.342	5060.328	5.405	5.046	1.442	29.251	26.870	13.395	8.645	22.063
2010.000	20265.556	5247.670	5.574	4.797	1.383	37.026	30.875	8.502	10.834	20.916
2011.000	23460.098	6146.056	5.766	4.861	1.318	40.470	35.743	6.429	13.627	18.837
2012.000	25503.371	5550.796	5.962	5.147	1.358	40.082	39.017	6.576	7.850	12.150
2013.000	28045.460	6296.297	6.167	5.396	1.360	40.483	44.114	6.978	7.758	9.521
2014.000	27150.647	7851.331	6.380	6.153	1.634	38.822	41.241	7.812	7.726	11.573
2015.000	21154.395	10016.545	6.603	8.632	1.753	37.140	47.176	10.101	7.627	13.250

A2: Short Run Estimation

Dependent Variable: D(LNRGDP)
Method: Least Squares
Date: 04/23/19 Time: 08:07
Sample (adjusted): 1989 2015
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.136427	0.074706	1.826185	0.0865
D(LNMILEXP)	-0.300402	0.136849	-2.195142	0.0433
D(LNGFC)	-0.046823	0.169873	-0.275633	0.7864
D(LNLF)	-0.347449	2.093556	-0.165961	0.8703
D(LNREER)	-0.234569	0.090133	-2.602483	0.0192
D(LNREXP_GDP)	1.101588	0.347150	3.173232	0.0059
D(LNRIMP_GDP)	-0.725152	0.246677	-2.939686	0.0096
D(LNINF_CP)	0.085173	0.068807	1.237842	0.2336
D(LNUNEMP)	-0.289457	0.188785	-1.533265	0.1447
D(LNLEND_IR)	-0.077561	0.095886	-0.808885	0.4304
ECM(-1)	-0.803153	0.280950	-2.858702	0.0114

R-squared	0.773346	Mean dependent var	0.064439
Adjusted R-squared	0.631687	S.D. dependent var	0.159991
S.E. of regression	0.097097	Akaike info criterion	-1.534654
Sum squared resid	0.150844	Schwarz criterion	-1.006720
Log likelihood	31.71783	Hannan-Quinn criter.	-1.377672
F-statistic	5.459210	Durbin-Watson stat	1.984929
Prob(F-statistic)	0.001409		

A3: Long Run Estimation

ARDL Cointegrating And Long Run Form
Dependent Variable: LNRGDP
Selected Model: ARDL(1, 1, 1, 0, 1, 1, 0, 1, 1, 1)
Date: 04/25/19 Time: 12:08
Sample: 1988 2015
Included observations: 27

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNMILEXP)	-0.084141	0.157455	-0.534382	0.6060
D(LNGFC)	-0.100190	0.239885	-0.417660	0.6860
D(LNLF)	4.862837	1.500622	3.240547	0.0101
D(LNREER)	-1.770589	0.379824	-4.661599	0.0012
D(LNREXP_GDP)	-0.366750	0.609052	-0.602166	0.5619
D(LNRIMP_GDP)	0.137296	0.367458	0.373637	0.7173
D(LNINF_CP)	0.432316	0.121033	3.571871	0.0060
D(LNUNEMP)	0.159072	0.287823	0.552674	0.5939
D(LNLEND_IR)	0.120545	0.156422	0.770640	0.4607
CointEq(-1)	0.460223	0.356425	1.291221	0.2288

Cointeq = LNRGDP - (-0.2700*LNMILEXP + 1.1439*LNGFC -10.5663*LNLF + 0.6635*LNREER + 3.8735*LNREXP_GDP -0.2983*LNRIMP_GDP -0.7090*LNINF_CP -1.2249*LNUNEMP -0.7122*LNLEND_IR + 154.7277)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMILEXP	-0.269951	0.448578	-0.601792	0.5622
LNGFC	1.143921	0.556215	2.056617	0.0699
LNLF	-10.566252	7.493337	-1.410086	0.1921
LNREER	0.663498	0.551357	1.203392	0.2595
LNREXP_GDP	3.873501	1.084215	3.572632	0.0060
LNRIMP_GDP	-0.298324	0.588038	-0.507322	0.6241
LNINF_CP	-0.708982	0.397236	-1.784790	0.1080
LNUNEMP	-1.224899	0.452629	-2.706187	0.0241
LNLEND_IR	-0.712240	0.807301	-0.882248	0.4006
C	154.727724	102.216162	1.513731	0.1644

A4: ARDL Bound Test to Co-integration

ARDL Bounds Test
Date: 04/23/19 Time: 14:56
Sample: 1989 2015
Included observations: 27
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	3.942552	9

Critical Value Bounds

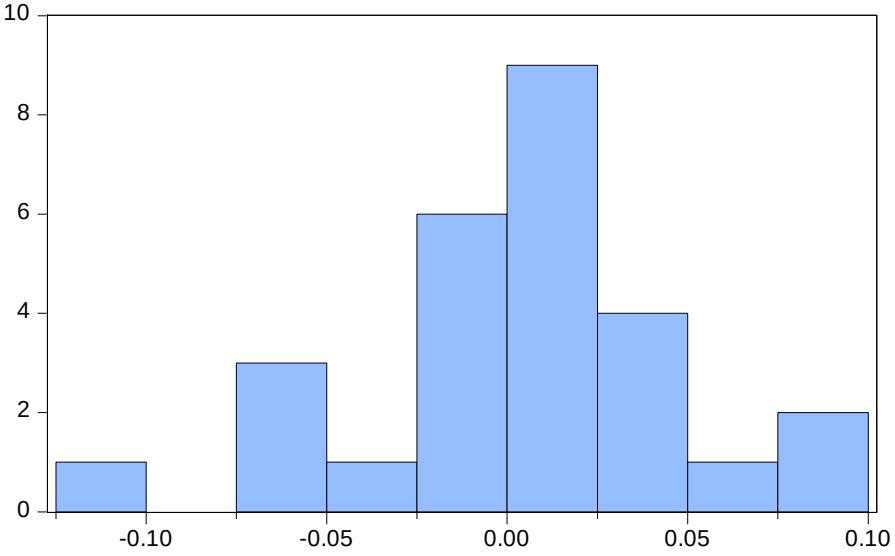
Significance	I0 Bound	I1 Bound
10%	1.88	2.99
5%	2.14	3.3
2.5%	2.37	3.6
1%	2.65	3.97

Test Equation:
Dependent Variable: D(LNRGDP)
Method: Least Squares
Date: 04/23/19 Time: 14:56
Sample: 1989 2015
Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNMILEXP)	-0.171612	0.163326	-1.050731	0.3208
D(LNGFC)	0.058631	0.198480	0.295401	0.7744
D(LNREER)	-1.381225	0.245413	-5.628169	0.0003
D(LNREXP_GDP)	0.075131	0.281740	0.266669	0.7957
D(LNINF_CP)	0.361793	0.099596	3.632611	0.0055
D(LNUNEMP)	0.050717	0.202865	0.250004	0.8082
D(LNLEND_IR)	0.025761	0.154823	0.166389	0.8715
C	-50.83070	15.17424	-3.349803	0.0085
LNMILEXP(-1)	-0.067056	0.202858	-0.330557	0.7485
LNGFC(-1)	-0.179340	0.171039	-1.048528	0.3217
LNLF(-1)	3.528409	1.107441	3.186093	0.0111
LNREER(-1)	-0.263901	0.107436	-2.456354	0.0364
LNREXP_GDP(-1)	-0.624191	0.600591	-1.039295	0.3258
LNRIMP_GDP(-1)	-0.174969	0.285513	-0.612823	0.5552
LNINF_CP(-1)	0.326802	0.125526	2.603458	0.0286
LNUNEMP(-1)	0.198685	0.291617	0.681323	0.5128
LNLEND_IR(-1)	0.195894	0.198872	0.985028	0.3503
LNRGDP(-1)	0.073615	0.230987	0.318698	0.7572

R-squared	0.925190	Mean dependent var	0.064439
Adjusted R-squared	0.783882	S.D. dependent var	0.159991
S.E. of regression	0.074377	Akaike info criterion	-2.124610
Sum squared resid	0.049788	Schwarz criterion	-1.260719
Log likelihood	46.68224	Hannan-Quinn criter.	-1.867730
F-statistic	6.547344	Durbin-Watson stat	1.350135
Prob(F-statistic)	0.003491		

A5: Normality Test



Series: Residuals	
Sample 1989 2015	
Observations 27	
Mean	2.21e-14
Median	0.004233
Maximum	0.092868
Minimum	-0.113526
Std. Dev.	0.042918
Skewness	-0.322928
Kurtosis	3.827664
Jarque-Bera	1.239928
Probability	0.537964

A6: Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.037664	Prob. F(17,9)	0.4994
Obs*R-squared	17.87848	Prob. Chi-Square(17)	0.3965
Scaled explained SS	2.808574	Prob. Chi-Square(17)	1.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/23/19 Time: 15:11
Sample: 1989 2015
Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.490527	0.903062	0.543182	0.6002
LNRGDP(-1)	-0.011664	0.014672	-0.794966	0.4471
LNMILEXP	-0.007228	0.006481	-1.115173	0.2937
LNMILEXP(-1)	0.008955	0.005580	1.604691	0.1430
LNGFC	0.003967	0.009875	0.401727	0.6973
LNGFC(-1)	0.000502	0.008617	0.058282	0.9548
LNLF	-0.023663	0.061771	-0.383082	0.7106
LNREER	0.013485	0.015635	0.862469	0.4108
LNREER(-1)	-0.010155	0.013367	-0.759765	0.4668
LNREXP_GDP	0.018145	0.025071	0.723748	0.4876
LNREXP_GDP(-1)	0.010944	0.023098	0.473820	0.6469
LNRIMP_GDP	-0.000879	0.015126	-0.058129	0.9549
LNINF_CP	0.000302	0.004982	0.060690	0.9529
LNINF_CP(-1)	0.001590	0.003917	0.405900	0.6943
LNUNEMP	-0.006157	0.011848	-0.519698	0.6158
LNUNEMP(-1)	-0.008187	0.009611	-0.851880	0.4164
LNLEND_IR	-0.010446	0.006439	-1.622281	0.1392
LNLEND_IR(-1)	0.002049	0.005711	0.358807	0.7280

R-squared	0.662166	Mean dependent var	0.001774
Adjusted R-squared	0.024035	S.D. dependent var	0.003040
S.E. of regression	0.003003	Akaike info criterion	-8.543835
Sum squared resid	8.12E-05	Schwarz criterion	-7.679944
Log likelihood	133.3418	Hannan-Quinn criter.	-8.286955
F-statistic	1.037664	Durbin-Watson stat	2.517919
Prob(F-statistic)	0.499363		

A7: Serial Correlation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.037733	Prob. F(1,8)	0.8508
Obs*R-squared	0.126751	Prob. Chi-Square(1)	0.7218

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 04/23/19 Time: 15:12
Sample: 1989 2015
Included observations: 27
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNRGDP(-1)	-0.038554	0.426193	-0.090461	0.9301
LNMILEXP	-0.004388	0.168138	-0.026098	0.9798
LNMILEXP(-1)	-0.001443	0.143644	-0.010046	0.9922
LNGFC	0.005440	0.255379	0.021303	0.9835
LNGFC(-1)	0.012654	0.230887	0.054805	0.9576
LNLF	-0.071671	1.630213	-0.043964	0.9660
LNREER	0.029767	0.430141	0.069203	0.9465
LNREER(-1)	-0.027183	0.371011	-0.073268	0.9434
LNREXP_GDP	0.061386	0.717787	0.085521	0.9339
LNREXP_GDP(-1)	0.059525	0.668169	0.089087	0.9312
LNRIMP_GDP	-0.049883	0.465978	-0.107050	0.9174
LNINF_CP	-0.003844	0.129593	-0.029661	0.9771
LNINF_CP(-1)	-0.010323	0.113845	-0.090674	0.9300
LNUNEMP	-0.015221	0.314483	-0.048400	0.9626
LNUNEMP(-1)	-0.022060	0.271914	-0.081129	0.9373
LNLEND_IR	0.006282	0.168651	0.037251	0.9712
LNLEND_IR(-1)	-0.001252	0.146939	-0.008518	0.9934
C	1.464823	24.40849	0.060013	0.9536
RESID(-1)	0.120630	0.621005	0.194250	0.8508

R-squared	0.004694	Mean dependent var	2.21E-14
Adjusted R-squared	-2.234743	S.D. dependent var	0.042918
S.E. of regression	0.077190	Akaike info criterion	-2.094069
Sum squared resid	0.047667	Schwarz criterion	-1.182184
Log likelihood	47.26993	Hannan-Quinn criter.	-1.822918
F-statistic	0.002096	Durbin-Watson stat	1.719547
Prob(F-statistic)	1.000000		

A8: Lag selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNRGDP LNMILEXP LNGFC LNLF LNREER LNREXP_GDP LNRIMP_GDP LNINF_CP LNUNEMP LNLEND_IR
Exogenous variables: C
Date: 04/24/19 Time: 20:10
Sample: 1988 2015
Included observations: 27

Lag	LogL	LR	FPE	AIC	SC	HQ
0	83.40273	NA	2.06e-15	-5.437239	-4.957300	-5.294528
1	395.9166	370.3868*	4.96e-22*	-21.17901*	-15.89967*	-19.60918*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

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