CEFFECT OF EXTERNAL DEBT ON ECONOMIC GROWTH OF RWANDA

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A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS OF THE OPEN UNIVERSITY OF TANZANIA

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CERTIFICATION

The undersigned certifies that he reads and hereby recommends for acceptance by the Open University of Tanzania, a Thesis entitled; “Effect of external debt on the economic growth of Rwanda:1991-2016” in fulfillment of the requirements for the Degree of Doctor of Philosophy.

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Dr. Felician Mutasa

(Supervisor)

…….

Date

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DECLARATION

I, Ngabo Yisonga Matabaro Roch, hereby declare that this thesis is my original work and has not been presented to any other university or any higher learning institution for a similar award.

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Signature

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Date

DEDICATION

This thesis is dedicated to my late Father Nongozi Matabaro Henri, my late Brother Muganguzi Fidèle, my late Grandfather Nongozi Nyagaza and my late Grandmother Monica Mwa Mugara, four people who have mostly loved me since I was born. I will never forget them. I also dedicate it to my wife Dr. Liliane Rumanya, my Children (Diane, Monique, Vanessa, Gloria, Miracle and Roch-Toussaint), my granddaughter Esther, my mother Esperance Mwa Luyagahwa and all my family members.

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ABSTRACT

The objective of this study was to investigate the effect of external debt on the economic growth of Rwanda. Three econometric models are developed in this thesis and aimed at demonstrating the relationship between external debt, public investment, private investment and economic growth. Results of the research obtained using the Ordinary Least Square method show that there exist a positive correlation between external debt and public investment. Analyses done came up with results that the relative probabilities for LExtD is less than 0. 05 and the coefficients is positive. In Rwanda, an increase of external debt of 1% ends at an increase of public investment of 0.08%; an increase of 1% of external debt entails an increase of 0.34% of private investment. These results show clearly that external debt positively impacts on private investment as public investment creates positive externalities of production for private investment. It has been noticed that the variable external debt has an effect on GDP as its estimated coefficients are statistically significant at 10% margin of error; its probability is less than 0.1. Furthermore, the coefficients related to external debt is positively correlated to the GDP. When LEXDEBT increases by 1%, the LGDP increases by 0.068%. This research is a contribution to a bulk of knowledge. It ends in the conclusion that external debt has a positive effect on the economic growth as it is allocated to public investments with externalities on private investment. This allows avoiding eviction effect. Nevertheless, it is recommended the implementation of macroeconomic policy likely to improve macroeconomic indicators in order to collect more taxes because external debt may become a threat for Rwanda beyond a certain threshold.

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LIST OF ABBREVIATIONS, SYMBOLS AND ACRONYMS

ADF	Augmented Dickey Fuller
AfDB	African Development Bank
ANC	African National Congress
BLUE	Best Linear Unbiased Estimator
BNR	Banque Nationale du Rwanda (National Bank of Rwanda)
BOP	Balance of Payment
CA	Current Account
CADTM	Comité pour l'Annulation de la Dette du Tiers Monde (Committee for for third world debt cancellation)
CUSUM	Cumulative Sum
DF	Dickey Fuller
DMC	Debt Management Committee
DRC	Democratic Republic of Congo
DSA	Debt Sustainability Analysis
ECM	Error Correction Model
EDPRS	Economic Development and Poverty Reduction Strategy
EU	European Union
EXP	Exports
EXTD	External Debt
EXDEBT	External Debt
FC	Fixed Capital
FDI	Foreign Direct Investment
GCF	Gross Capital Formation

GDP	Gross Domestic Product
GDPCP	Gross Domestic Product at Constant Price
GNP	Gross National Product
GoR	Government of Rwanda
HIPCs	Highly Indebted Poor Countries
IDA	International Development Agency
IMF	International Monetary Fund
LF	Labor Force
Log	Logarithm
LDC	Low Developed Countries
MDGs	Millennium Development Goals
MDRI	Multilateral Debt Relief Initiative
MINECOFIN	Ministry of Finance and Economic Planning
NBR	National Bank of Rwanda
NBER	National Bureau of Economic Research
NIC	Newly Industrialized Countries
NISR	National Institute of Statistics of Rwanda
NPV	Net Present Value
OBL	Organic Budget Law
OLS	Ordinary Least Square
PEXP	Public Expenditures
Prob.	Probability
PV	Present Value
RES	Reserves

RESIDLR	Residuals of Long Run
Rwf	Rwandan Francs
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UK	United Kingdom
US	United States
USA	United States of America
USD	United States Dollar
VAT	Value Added Tax
WB	World Bank

CHAPTER ONE

INTRODUCTION

1.1. Background to the Study

All countries are indebted either through public external or public internal debt. Thus, even though the United States is known to be the biggest economy in the world, or precisely for that reason, they have not been prevented from uncontrolled growth of debt, public and private. According to CADTM (2015), the USA public debt has been evaluated at 15 239 billion of dollars in 2012 (around 104% of GDP). It was 14 089 and 1766 billion US dollars in 2012 in EU and Low developed countries respectively. For EU countries it represents around 93.5% of GDP. The debt of African countries represents 200 billion of US dollars (around 40% of GDP). So, debt is a world issue since every country is indebted though the level of indebtedness is different depending on the country. It is about both, external and internal debt.

External debt is the financial instrument mostly used in low developed countries. External debt is the debt a country incurs by borrowing in foreign currency. Sometimes external debt becomes unsustainable, imposes higher risk to economic prosperity, as its servicing which is also an indicator of higher current deficit, may lead to debt overhang in a country. If the external debt is not used in income-generating and productive activities, the ability of a debtor nation to repay the debt is significantly reduced (Siddique and Selvanathan, 2015). Higher domestic borrowing increases domestic interest rate which leads to crowding out that further slows down the economic growth. This does not prevent countries from

resorting to external debt in order to address weaknesses of public saving. Hence the question related to the effectiveness of external debt i.e. its capacity to reach objectives requires an answer for every country. Indeed, Government resorts to external debt because it expects positive effect on the economic growth in particular and on development in general. Unfortunately this has not been always the case. Research conducted in different countries revealed that the effect may be positive or negative.

There is no unanimity about the contribution of debt to development and growth when it comes to knowing whether the relationship is positive or negative in light of many discussions found in the literature. According to Raffinot (1991), it is worth distinguishing developing countries or group of countries for which external funding has a positive impact. External financing has allowed them to increase exports and incomes, thus the debt payback was easy. Cases mostly quoted are those of Asiatic countries, especially “Newly Industrialized countries”.

Economic literature has investigated many channels through which growing public debt might hamper long-run growth prospects in developing countries, particularly focusing on foreign borrowing. First, a large public debt might create debt overhang, a situation in which investments are reduced or postponed since the private sector anticipates that the returns from their investment will serve to pay back creditors (Krugman, 1988; Sachs, 1989 as cited in Presbitero, 2010). In the case of Europian Union, Shesherita and Rother (2010) led a study in which they noticed that beyond a certain threshold debt becomes inefficient.

Lyoha (1999) found that debt stock reduction would have significantly increased investment and growth performance in Sub-Saharan countries. Rifaqat and Mustafa (2012) state that effects of external debt accumulation on investment and economic growth of the country are always remaining questionable for policy-makers and academicians. When external debt is accumulated beyond a certain limit, it will contract the economic growth by hampering investment because high taxes are anticipated. This verifies the occurrence of debt overhang situation in Pakistan.

Likewise, a study led by Diallo (2003) on the case of Guinea reached conclusion according to which, external debt acts negatively on economic growth, especially if we base on the ratio debt/export. Ezeabasili (2011) came to the same result as regards the case of Nigeria. Chamkhi (2011) talks about debt like a neocolonialist mechanism which prevents efforts of Tunisia related to its social and economic development to reach its objectives. He argued that debt prevents Tunisia from reaching its social and economic objectives of development. Moreover debt repayment increases problems of the Tunisian society.

At the side of these pessimistic results related to the contribution of debt to development, other researches are more optimistic, though they present some unavoidable requirements. In her thesis, Elouar (2009) claims that debt is an essential factor of development process if it is focused on productive activities and which bring monetary surplus. Most of LDC don't respect that requirement, their debt are used for current expenses. Public debt is a constraint to public decisions we should agree with Lemoine (2011). The issue of debt management is highlighted at this level. According to Ajili (2007), it should focus on elements of public policy.

Instructions of World Bank and International Monetary Fund want debt management to match with monetary and fiscal policies.

Rwanda, a small country located at the heart of the African continent is not an exemption to the general issue of debt which affects all African countries in particular, and LDC in general. Rather it is one of the heavily indebted countries. The Government of Rwanda requires large external flows to finance and implement its ambitious economic development programs. Domestic financial resources from domestic revenues, domestic borrowing and others are currently not sufficient to finance the development plans. Therefore, external debts are contracted to fill the gap.

The BNR (2013) reveals that external debt of Rwanda in 2013 amounted to 1 039 billion Rwandan Francs; that is, 17.4% of the country GDP. In 2016, the external debt of Rwanda was 1 984 billion Rwf. Indeed Rwanda relies on the external debt because of low income, low saving ratio, low investment levels and low taxable capacity which causes the saving- investment deficit as well as the deficit in the balance of payment (BOP). The effort of Rwanda to achieve the country's long-term development aspirations i.e. to increase in an equitable way the GDP, to reduce the number of poor people, to increase life expectancy and to reduce illiteracy requires more funding.

As a result there has been an increased borrowing of money from various sources in order to build various sectors of the economy which also makes repayment of such debts difficult. The repayment of debt requires a certain number

of strategies which are connected to the management of debt. In fact, as said previously, theoretical as well as results of empirical literature based on the case of several countries show that the contribution of debt to the economic development in general and economic growth in particular can be positive or negative from one country to another. However, such researches do not point out government responsibility nor do them provide adequate explanations on the relationship between State decisions related to the way external debt is used to finance public investments which create externalities for private investments. This thesis on the case of Rwanda studies that relationship.

Although Rwanda has reached the completion point of Heavily Indebted Countries in 2005, it is still one of the most heavily-indebted countries in the world. According to the IMF (2016), though Rwanda remains at low risk of external debt distress, external public debt has increased in recent years, rising from around 17 percent of GDP in 2012 to 24 percent in 2014. From the completion point up to 2016, the external debt of Rwanda had moved from 479. 7 million USD in 2006 until 2451.9 million USD in 2016. It means that Rwanda has not stopped resorting to external debt. So, the concern in this study is to know whether external debt is favorable to the economic growth of Rwanda or not, and at which condition. Hence, among questions requiring answer in this thesis, the one on the relationship between external debt and public investment is inevitable.

1.2. Problem Statement

Developing countries are characterized by economic imbalances among which we can quote budget deficit (Ngabo, 2009). In front of budget deficit, Government can

either resort to banknote plate or public debt. Banknote plate is in some cases source of inflation. Thus, despite consequences of debt on the economy, a State finds necessary resorting to it as a means addressing public deficit. The contribution of external debt to economic growth is controversial since it may have a positive or negative effect. Debt is presented by some authors as a burden. Among them some present external debt as a burden for future generations since it requires more taxes in the future. Perkins (2011), states that debt creates crisis while Todaro (2011) argues that external debt has a cost.

On the other hand, the literature presents external debt as an opportunity. Among authors who developed such idea one can quote Keynes who states that public deficit honestly financed by debt stimulates production, makes wide the fiscal basis and allows the repayment of public debt in the future (Bofoya, 2011). Thus the debt payback was easy. It is the case of Asian countries, especially "Newly Industrialized countries". The same idea is supported by empirical evidences. Different experts are of the view that external debt has favorable effect on economic growth. Among them one may quote: Jayaraman and Lau (2001) cited by Siddique and Selvanathan (2015), Elouar (2009), etc. However, according to Mulugeta (2014), external debt burden requires due attention of policy makers. An increase in external debt servicing decreases GDP growth and there is evidence for existence of crowding out effect in Ethiopia. Ezeabasili, et al. (2011) ended with the same result as regards the case of Nigeria.

Debt in general and external debt in particular is a world issue of which Rwanda is not exempted. Arguably, the indebtedness of Rwanda is structural, given its

connection with its economic situation. No serious investigation had been done to demonstrate the effect of external debt on the economic growth of Rwanda. Besides, no research among the previous ones had shown clearly through which economic mechanism external debt can impact on economic growth in Rwanda. That is why the case of Rwanda requires an empirical analysis. Indeed, this thesis aims at showing that external debt will become profitable to countries if it is allocated to public investments, which means a positive relationship between external debt and investment. In contrast, otherwise it will on the other hand become a threat for the economic growth and a stumbling block in the development process.

Therefore, the main purpose of this thesis is to analyze the case of Rwanda in order to know whether debt is a useful instrument to boost the economic growth in long run. Thus, the problem statement of this study is oriented towards three concerns. The first is related to the relationship between external debt and public investment. The second issue is to analyze the effect of external debt on private investment. The third one is to analyze the effect of external debt on economic growth of Rwanda.

1.3. Research Objectives

1.3.1. General Objective

This research aims at examining the effect of external debt on the economic growth of Rwanda.

1.3.2. Specific Objectives

There are three specific objectives to the present research:

i) To examine the effect of external debt on public investment in Rwanda;

ii) To analyze the empirical relationship between external debt and private investment for the case of Rwanda;

iii) To study the effect of external debt on the growth of output in Rwanda.

1.4. Research Hypotheses

Hypotheses of this research are:

i) External debt has a positive effect on public investment in Rwanda;

ii) There exists a positive empirical relationship between external debt and private investment in Rwanda;

iii) External debt has a positive effect on the growth of output in Rwanda.

1.5. Scope of the Study

The scope of this research concerns the scientific domain, the space and time. As far as the domain is concerned, it focuses on macroeconomics, public finances and economic development. In terms of space this study is conducted within the boundaries of Rwanda. In time, this work covers the period from 1991 up to 2016 for econometric analysis. This long period has been chosen because time series data are needed to lead an econometric analysis.

1.6. Significance of the Study

This topic on external debt is an up-to-date topic since developing countries have not stopped resorting to external financing. After the completion point, Rwanda has not stopped borrowing from outside. In 2016 its external debt is bigger than it was before the completion point. In December 2017, while I was making analyses related to this study, it was announced that Rwanda had borrowed new loans from IDA and

AfDB in order to finance new projects related to electricity and water. This study is useful for the scientific world because it scientifically shows the way a good use of external debt can lead to achievement of development objectives. External debt acts positively on the economic growth when it is allocated to precise public investments which are connected to programs or strategies of development determined in advance by State.

1.7. Structure of the Thesis

This study has been structured as follows:

Chapter one is devoted to the general introduction mainly highlighting the problem statement, background to the study and objectives of the research. As it is important to know some theories related to debt, the second chapter deals with literature review. Chapter three is related to the research methodology. Chapter four is the one in which the results of the research are presented. The empirical relationship between external debt and public investment as well as the correlation between external debt and private investment are analyzed in this chapter. Lastly in the chapter four, the effect of external debt on the economic growth has been analyzed. This has been done basing on an econometric analysis. The last chapter constitutes the general conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1. Chapter Review

Many authors, mainly macroeconomists have been interested in external debt. We find ideas related to the effect of external debt from Keynes to newly published books of macroeconomics. Also, many articles on external debt exist. Most of the literature on external debt focuses on developing countries which have been mostly concerned by the issue of indebtedness from the first oil shock that occurred in 1973. A wide theoretical literature review on debt, especially external debt exists and is presented in the first section of this chapter. The empirical literature review discussed in this chapter is the summary of researches which have been led in several countries or regions on the effect of external debt on the economy or economic development, or more specifically on the economic growth.

2.2. Conceptual Definition

The most relevant concepts to this thesis are: external debt and economic growth.

2.2.1. External Debt

According to Todaro, and Smith (2012), external debt is total private and public foreign debt owed by a country. The IMF (2014) defines gross external debt, at any given time, as the outstanding amount of those actual current, and not contingent liabilities that require payment(s) of principal and/or interest by the debtor at some point(s) in the future and that are owed to nonresidents by residents of an economy.

2.2.2. Economic Growth

Economic growth is an increase in production of goods and services over a specific

period. GDP is the best way to measure economic growth. It takes into account the entire economic output (Stephen, 2008). In the following section, further explanations drawn from the literature review are supplied on concept of external debt and its theoretical linkage with economic growth.

2.3. Theoretical Literature Review

2.3.1. The Concept Debt

Debt is a sum of money, or a quantity of goods and services, owed by one individual or body to another. A debtor nation is a nation whose collective foreign debt exceeds the foreign debt owed to it. Some countries become debtor nations because their balance of trade is consistently unfavorable, that is, their imports exceed their exports (Maidan, 2012). Debt is the consequence of many factors. It is the consequence of public resources management by Government. Government uses debt as a last resort when it cannot finance public expenditures thanks to resources from taxes and non-fiscal revenues. When a Government spends more than it collects in taxes, it borrows from the private sector to finance the budget deficit (Mankiw, 2003).

Public or national debt is the amount of currently outstanding federal securities that the treasury has issued. It is what the federal Government owes to the holders of treasury bills, notes, bonds, and certificates. Exactly, national debt is the cumulative total of all the federal budget deficits (Stephen, 2008). Sharp, et al. (1992) define national debt or gross federal debt as all securities issued by the federal government, interest-bearing and noninterest-bearing securities, securities held by citizens of this country, securities held by citizens of other countries, securities held by government

agencies and trust funds, those held privately (individuals, businesses, insurance companies, etc.), securities held by Federal Reserve, and those held by commercial banks.

Literature review focuses mainly on external multilateral and bilateral debt. However, it is important to differentiate long-term external debt from short-term external debt as well as public debt and private debt. Short-run external debt is defined as the debt which has an original maturity of one year or less while according to the world-bank, long-term external debt is the one that has an original maturity of more than one year and that is owed to non-residents and repayable in foreign currencies (Corbridge, 1993). Long-term external debt has three components:

i. Public debt which is an external obligation of a public debtor, including the national government, a political subdivision and autonomous public bodies;
ii. Publicly guaranteed debt, which is an external obligation of a private debtor that is guaranteed for repayment by a public entity;
iii. Private non-guaranteed external debt, which is an external obligation of a private sector that is not guaranteed by a public entity.

Debt service is the amount related to the payment of capital and interest during a given year (Perkins, et al., 2011). Economists have shown great interest in external debt. Analyses on this subject have been sufficiently covered in the economic theory, showing a particular interest by economists that mostly highlights causes of external debt as well as its effect on economy of borrowing countries. In this section of the thesis, theories related to external debt are presented. Such theories are drawn from macroeconomics, international economics books and some articles published on

topics such as debt management, debt relief, effect of debt on economic growth, etc.

Historically, external debt had led developing countries to crisis. Despite this situation, developing countries have not stopped borrowing money from other countries or from international financial institutions. One can wonder whether this is a rational behavior taking into account effects of external debt and difficulties to repay for some countries in the past. Several authors attempted to bring an answer to that question throughout literature. They discussed the negative and positive effect of external debt as well as its contribution to economic growth. Before making a theoretical overview of the discussions on the effects of external debt it is important to look at some theories which have been developed on external debt.

2.3.2. External Debt and Growth Theory

Many theories have been developed on the relationship between external debt and economic growth.

2.3.2.1. Neoclassical Growth Theory

The neo-classical economic growth theory, for instance the Solow economic growth model demonstrates that the long run economic growth rate is supposed to be fixed and it is equivalent to the population growth or the labor force (Eichengreen, 1998). The assumption behind this is that there is a diminishing marginal return to scale with a given technology. Therefore, in this structure different countries will converge at the same steady state level with zero per capita growth (Eichengreen, 1998).

However, the big challenge here is to get and apply the golden rule meaning that the countries have to apply a saving rate maximizing the per capita across future

generation consumptions. The implication behind this is that the absolute convergence hypothesis will be applied, thus, different countries will converge at the same level of steady State. By facilitating the convergence, the neoclassical assumption stipulates that rich have higher level of capital per worker which implies a lower marginal product of capital. Therefore, a beneficial movement of capital from rich to poor countries will be observed. Meaning the developing countries' economic growth will grow faster (Eichengreen, 1998).

2.3.2.2. The Intertemporal Choice Theory and National Debt Burden

The literature analyses the negative effect of debt on the economy through three main assumptions. Under the assumption that the future generation must be taxed to pay the interest burden on the debt, that generation must undergo a real reduction of income, without the compensation of increased future consumption. In this sense, the burden of the debt falls on the future generation. The burden of the debt, therefore, is a reduction in welfare for future taxpayers. Future generations will pay more in taxes to pay interests instead of receiving government goods and services in return for those taxes (Human, 1996). Future generations will suffer a reduction in their living standards as a result of the federal debt if past deficits cause interest rates to rise and reduce private investments. A reduction in private investments implies that the capital stock of the nation will grow more slowly than it would have been otherwise. The effect will be to lower economic growth (Human, 1996).

Although the popular view on the burden of government debt is faulty, economists have pointed out several ways in which government debt can become a burden on future generations (Abel, et al., 2011). First, if tax rates have to be substantially

raised in the future to pay off the debt; the resulting distortions could cause the economy to function less efficiently and impose costs on future generations. Second, most people hold small amounts of government bonds or no government bonds at all (except perhaps indirectly, as through pension funds).

In the future, people who hold few or no bonds may have to pay more in taxes to pay off the government debt than they receive in interest and principal payments; people holding large quantities of bonds may receive more in interest and principal than they pay in increased taxes. Bondholders are richer on average than non-bondholders, so the need to service the government debt might lead to a transfer of resources from the relatively poor to the relatively rich. However this transfer could be offset by other tax and transfer policies, for example, by raising taxes on people with high-income. Third, government deficits reduce national savings; that is, when the government runs a deficit, the economy accumulates less domestic capital and fewer foreign assets than it would have if the deficit had been lower (Abel, et al., 2011).

If this argument is correct, deficits will lower the standard of living for our children and grandchildren, both because they will inherit a smaller capital stock and because they will have to pay more interest to (or receive less interest from) foreigners than they otherwise would have. This reduction in the future standard of living would constitute a true burden of the government debt. Therefore, debt ends by an intertemporal choice. Public debt is a priority for authorities and analysts since when a government is into debt, it is taking an important intertemporal choice using resources of the administrations of the future in order to meet current needs (Sanchez

and Almada, 2016).

External debt is a burden in these ways (Tayebwa, 1998):

i. it deprives the country of foreign exchange which is used to pay the debt with the rate of interest;
ii. repaying the debt must mean that the government has to cut down expenditure on public goods;
iii. sometimes external loans are tied "strings" (conditions). In some cases external debt are more available for non-productive projects and which rank very low in national priorities;
iv. if it is a dead weight, the future generations would have to suffer paying debt whose benefit they do not realize;
v. long term debt is a burden to future generations who are to pay back future debts.

In fact, debt financing implies the sale of a security that bears the promise to pay interest over a given number of years and to return the principal loaned at the end of the given time of period. The burden of the debt is the redistributive effect of debt financing (Human, 1996).

However according to Lerner (1948) quoted by Rosen (2010), an internal debt creates no burden for the future generation. Members of the future generation simply owe it to each other. When the debt is paid off, there is a transfer of income from one group of citizens (those who do not hold bonds) to another (bondholders). Future generation as a whole is no worse off in the sense that its consumption level is the

same as it would have been.

Therefore, no general agreement exists among economists regarding a definition of the burden of the debt. The onerous burden of the debt on future generations is often cited as a reason to reduce the debt. On the other hand, many argue that, because the public debt is largely held by citizens of this country, rather than by foreigners, no burden exists because it is an internal debt. That is to say that, because we owe the debt to ourselves, payment of interest and principal of the debt merely transfers income from taxpayers to debt holders (Human, 1996).

Thus, the question whether financing government expenditures by borrowing rather than taxation has given rise to a great deal of confusion among laymen and economists. A nation owing money to other nation is impoverished or burdened in the same way as a man who owes money to other men. But this does not hold for national debt which is owed by the nation to citizens of the same nation… We owe it to ourselves (Lerner (1948) cited by Atkinson and Stiglitz (1980).

Sharp (1992) argues that large national debt may lead to a bankruptcy (if government is not able to meet its obligations) or shifting of the debt burden. Indeed many people are concerned about the national debt because they are worried about its burden on the future generations. They would argue that, when the debt is incurred, the current generation is postponing paying for government goods and services and shifting the cost or burden to the future. Authors suggest only two cases in which government can borrow (Sharp, 1992):

1. Public investment: government borrowings may be the efficient way to pay

for investment or capital goods. These goods such as bridges, dams, schools, and hospitals provide benefits or real income to the society over a period of time.

2. Economic instability: if the economy operates at full employment without inflation, the only justification for government borrowing would be to finance public investments. However, this is not the case. The economy experiences ups and downs; that is the economy experiences economic instability. A responsibility of the government is to pursue a fiscal policy that tends to stabilize the economy.

2.3.2.3. Debt Laffer Curve Theory

This was first introduced by Sachs (1989) as cited by Presbitero (2010), through the theory of debt overhang and the logic behind was perfected by Krugman (2012). According to this theory, external debt could have positive impact on investment and growth (upward sloping) but if a country borrows too much and surpasses a certain threshold of the level of debt then it may result to negative impact on economic growth (down sloping). Rubio (2003) quoted by Sanchez and Almada (2016) suggested that if the amount of debt in relation to GDP is put in the axis of abscissa, with the contribution of the debt to the GDP growth on the y-axis, it will be observed that, between these two series, there is a non linear relationship, and instead an inverted u shaped curve appears. So the debt contracted at the beginning generates growth, but then stops it. This is explained by the likelihood of non-compliance in the payment from certain threshold considered high levels of indebtedness and the consequent detrimental effect on both public and private investment.

The curve thesis shows that more debt is high, more the probability of debt pay back is weak. On the first part of the curve, more nominal value of the debt increases, more anticipations for payback increase. However in the second part those anticipations decrease (Patillo, et al., 2002). The theory predicts that if debt is below critical threshold, there is a trend to stimulate investment and growth. Therefore, the lesson drawn from Laffer curve is that a moderate evolution of debt is profitable to investment and growth while at the other side, two much debt can hamper the expansion (Patillo, et al., 2002). In one word debt has a non linear effect on investment and growth according to the Laffer thesis. The relationship between debt and investment is represented by an inverted u.

2.3.2.4. The Dual Gap Analysis

It explains that development is the function of investment which requires domestic savings. If domestic saving is not sufficient, there must be the possibility of obtaining from abroad the amount that can be invested to fill the gap (Balogo, 2014) cited by Masika (2016).

2.3.2.5. Debt Overhang Theory

Borenstein (1991) quoted by Ejigayehu (2013) defines debt overhang as a situation in which the debtor country benefits very little from the return to any additional investment because of the debt service obligations. For him debt overhang is a condition when the debtor country fails to service its foreign debt obligation fully with the existing resources, and undertakes a negotiation with creditors to determine actual debt payment. As a result, part of the increase in output will be used to pay the forthcoming debt. This in turn creates a disincentive on private investment and poses

a hindrance on the government to pursue the right policies.

Debt overhang refers to a situation where the debt stocks exceed the country repayment ability. Some of the returns from domestic economy are effectively taxed away by existing foreign creditors and investment by domestic and foreign investors will be discouraged what deteriorate the level of economic growth (Claessens, et al., 1996). Therefore according to Were (2001) the debtor country shares only partially any increase in output and exports because a fraction of that increase will be used to service the external debt. Accumulated debt stock reduces economic performance through debt overhang effect what means tax disincentive and macro-economic instability. Tax disincentive means that a large debt stock discourages investment because potential investors assume that there would be taxes on future income in order to make debt repayment (Claessens, et al., 1996).

On the view of Njuguna (2006) quoted by Aryeetey, et al. (2012), the external debt overhang problems became a force and major risk in Africa, preventing appropriate adjustments and reforms in the 1990s. Empirical and analytical studies in 1990s were unanimous that the magnitude of external debt problem in Africa was shackling its growth and investment. The debt burden significantly threatened Africa's hope of future economic growth recovery. Drastic actions were needed to help these countries going out of the conundrum. Those persuasive arguments led to bilateral and multilateral initiatives to either cancel or restructure Africa's external debt. The HIPC initiative was launched in 1996 to reduce external debt of HIPCs to manageable levels, and also to create an appropriate signaling mechanism for

macroeconomic stability and low country risk. The Multilateral Debt Relief Initiative (MDRI) was launched in 2005 to make available additional resources to the HIPCs to help them to achieve UN Millennium Development Goals (MDGs).

2.3.2.6. The Liquidity Constraint Hypothesis

It refers to the situation whereby an increase in external debt servicing reduces funds available for investment and growth. This will low possibility of a country to service their debt and it will affect their ability to borrow further from abroad. Were (2001) comments that if greater portion of export revenue is used to service external debt, very little is available for investment and growth. Further details on negative effects of external debt are presented in the subsection above.

2.3.2.7 The Keynesian Theory

A part from the Dual Gap Analysis and the Laffer Curve Theory, this thesis is based on the Keynesian theory. Indeed, the effect of external debt has been highlighted long time ago by the founder and father of macroeconomics. Keynes argues that a public deficit honestly financed by debt stimulates production, makes wide the fiscal basis and allows the repayment of public debt in the future (Bofoya, 2011). For Keynes, the weight of public debt is from somewhere else. It can be found in public management inefficiency, bad decision making in the allowance of public resources, eviction effect, transformation of saving in current expenditure reducing capital accumulation and stopping economic growth (Bofoya, 2011). Linkage between most important variables analyzed in this research has been established in these theories i.e. investment, external debt and economic growth.

2.3.3 Negative Effect of Debt

Most theories on debt developed in the previous subsection demonstrate that the indebtedness may be favorable or not. In this section, further theories on negative effect of external debt have been developed. Debt becomes a real burden when the creditor has to pay. Debt creates financial crisis especially when it is about short run debt. Exit of capitals provokes reduction of exchange rate and increase of interest rate. A borrowing policy to finance consumption or bad conceived investments can create difficulties. It looks easier to borrow than to raise taxes (Perkins, et al., 2011).

Another assumption is that foreign borrowings have a cost. While foreign borrowing can be highly beneficial providing resources necessary to promote economic growth and development, it has its cost. The main cost associated with the accumulation of a large external debt is 'debt servicing'. Debt servicing is the payment of amortization (i.e. the liquidation of the principal) and accumulated interest; it is a contractually fixed charge on domestic real income and savings (Todaro, 1992). The debt servicing may end at the problem of default especially in low developed countries. The weight of debt becomes heavier when the borrower country is confronted to the problem of default i.e. it is not able to repay according to the loan contract (Todaro, 1992).

The capacity of a country to avoid default depends on the origin and use of funds. For instance, the origin of debt crisis in Developing Countries was the 1973 oil crisis. Literature on external debt shows that the way external funding is utilized is the factor that determines the consequence of debt on the economy. Adda (1997) states that most of Latin American countries, some countries of Asia such as South

Corea or Phillipines and some African countries had taken benefit of the financial basket, (that is Eurodollars) for the best and the worth. The best when borrowed funds were allocated to profitable investments, likely to increase supply of exports and reduce imports (case of South Korea); the worth when funding are used to finance increase of consumption of imported products (case of Chili) or to finance current expenses of States (example of Nigeria) or to finance expenses related to war (case of Iraq), not profitable investments (Algeria) or to feed the evasion of capitals (case of Argentina).

The negative effect of external debt has been also examined at the level of balance of payment. Debt has some consequences on economy. In the long run debt as well as its interests has to be paid. So in the long run, debt can negatively impact the balance of payment. According to Todaro (1992) the basic transfer turns negative for developing nations. The basic transfer of a country is defined as the net foreign-exchange inflow (or outflow) related to its international borrowing. It is measured as the difference between the net capital inflow and interest payments on the existing accumulated debt. The net capital inflow in turn is simply the difference between the gross inflow and the amortization on past debt.

Cohen (2000) advocates that debt is a trap and a drug which postpones problems. Thus, since debt is a problem, its cancellation is a solution. Then, action is also needed on so-called ‘odious debt’ racked up by corrupt or repressive regimes. Until 2006, Ethiopia, for example was still repaying debt incurred by the repressive Mengistu regime that was on power from 1974-1991. Similarly, the ANC

government in South Africa is repaying debts incurred to apartheid, and the Chilean government is paying off debts taken on by the dictator Augusto Pinochet.

A solution would be to forgive odious debt through some forms of international adjudication, and by giving the UN the authority to declare 'credit sanctions' against current regimes. The UN should make it clear that debts to these regimes would be considered odious. This would prevent the 'immoral hazard' of banks and governments lending to repressive regimes and saddling their people with the obligation to repay the loans (Duncan, 2012). In one word, if negative effects shown above are taken into consideration, actions should be undertaken in order to reduce indebtedness, especially in Low Developed Countries. Only reduction is possible, not suppression because debt is in some case profitable to the economic development. On the side of these negative effects, the economic theory has been interested to advantages of debt for the economic growth in particular and economic development in general. They have presented it as an opportunity.

2.3.4. Positive Effect of Debt

In the previous subsection indebtedness has been presented by several authors as a threat for countries in general and low developed countries in particular. However, other authors have developed ideas according to that debt is also an opportunity for the development process demonstrating that debt has some positive effects.

2.3.4.1. Economic Justification of External Debt

As previously pointed out, distinction of external debt (international borrowings) from internal debt (national borrowings) must be made. In general, borrowing is a

factor which helps boosting economy in a case of recession. It compensates the fiscal pressure and is repaid when the country comes back to expansion (Muzellec, 2004). The domestic current account balance deficit is the main reason that explains international borrowings (Krugman , 2012). Economically, the fiscal pressure should not go beyond a certain threshold beyond which the economic activity should be asphyxiated (Varoudakis, 1994). Current account balance is written, CA=S-I, with S=Saving, I=Investment. If national saving falls to short of domestic investment, the difference equals the current account deficit (Krugman, 2012).

Indeed, domestic saving and foreign capital imports are the two sources of domestic investment (Yujiro, 1997). For developing economies in which investment needs for development tend to exceed domestic saving capacities, capital imports from abroad represent a possible escape from a vicious circle of weak economic growth and low saving. The role of foreign capital imports is bridging the gap between domestic investments and saving could be quite significant as illustrated by the case of Tanzania in which domestic investment increased despite a sharp decline in the domestic saving rate for 1965-1990. However, the danger exists in the fact that the capital imported may accumulate to the point of insolvency at a national level, such that the borrowing country will become unable to meet the debt-service obligations (Yujiro, 1997).

In theory, it is not wrong for developing economies to rely on external credits to finance their domestic investments. If borrowed funds could be utilized effectively to put in place production facilities, commodities produced, therefore, they would contribute to reduction in imports, and further, to expansion in exports. If external

debt could be paid back by foreign exchange thus saved or earned, no serious accumulation of external debt would arise. In fact, fast growing economies in East Asia, especially Korea, borrowed heavily in their development process (Yujiro, 1997).

Principles of good management of international funding teach that normally net transfers of capitals must be done from rich countries to poor countries. The debt can and must grow: far from being a problem, it is an unavoidable tool of recovering (Nahavandi, 2005). One can notice that debt is always justified though its impact on the economy is not always positive. Foreign debt had been considered as strategy of economic development and growth in the past. USA had borrowed during 19th century to finance its expansion towards the western. European countries have sometimes relied on foreign borrowings. Indeed, borrowing allows a country to invest more than its savings. To reach that objective, borrowings should finance productive investments so that the return on investments allows repaying the capital and interest of debt. In this context, borrowing can contribute to favor economic growth and development. It is better in some cases than FDI which requires repatriation of profits, fiscal exemptions, etc. (Perkins, et al., 2011).

2.3.4.2. Impact of Debt on Economic Growth and Development

Many authors have presented several models and theories related to production factors and economic growth. The most important in the economic theory are: the Harrod-Domar model, the Keynesian theory, the Cobb-Douglas function and Solow model. Most of those models present labor, capital and money supply as factors likely to act on economic growth. However, Raffinot (1991) emphasizes on the fact

that research on growth models have highlighted the importance of unexplained part of growth by traditional production factors (capital, labor). For example it is difficult to make a reliable assessment of no directly unproductive expenditures (education, health) on growth. Also, some countries have managed to use external funding in a productive way, and then it has contributed to their economic growth.

The following frame has been developed by Raffinot:

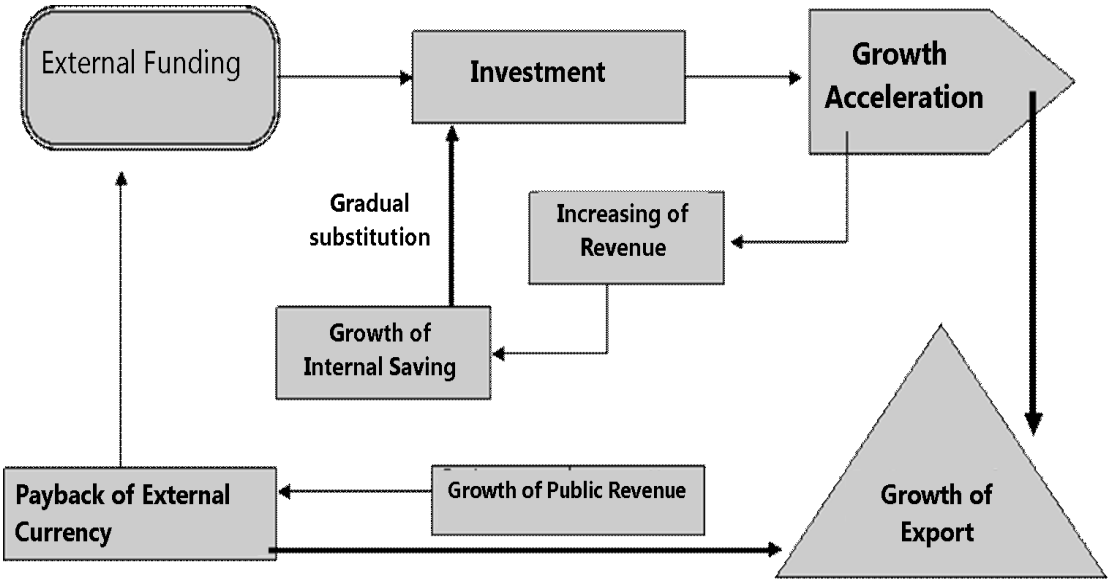

Figure 2.1.: The Raffinot Chart
Source: Raffinot (1991)

It is obvious that, views of authors on the contribution of debt on economic growth and development differ. As seen in the previous sub-section, some authors regard debt as a burden for future generations while according to others debt under some conditions may contribute to development.

Discussions have been led in literature on the role of external debt in the development process. For Rosen (2010), if money borrowed from overseas is used to finance current consumption, the future generation certainly bears a burden, because its consumption level is reduced by an amount equal to the loan plus

accrued interest that must be sent to foreign lenders. If on the other hand, the loan is used to finance capital accumulation, the outcome depends on the project's productivity. If the marginal return of the investment is greater than the marginal cost of funds obtained abroad, the combination of the debt and capital expenditure actually makes the future generation better off. To the extent that the project's return is less than the marginal cost, the future generation is worse off.

According to Maquart (1989) cited by Masika (2016), borrowing is neither abnormal for a company nor for a country. Rather it is often the sole way to produce in order to sell tomorrow. Investments must be bought today while money is waited later. So, for a country which is still furnishing itself money from abroad it is indispensable. Unfortunately in developing countries, the increase of indebtedness is sometimes superior to the one of wealth it is supposed to produce. The consequence is that from 1984, these countries transfer more resources towards developed countries than they receive from them.

Foreign capital, either public or private can play a crucial role in breaking an emerging country's circle of poverty by supplementing its saving and investment. To address needs in terms of infrastructures, many developing countries need to attract either domestic or foreign private capital (McConnell and Brue, 2002). Nautet and Meensel (2011) state that public debt tends to increase the disposable income of the current generation while – *ceteris paribus* – reducing that of future generations. It, therefore, seems obvious to assess the debt level in an intergenerational framework. The principle of rationality should guide every decision related to credit. Borrowing or using credit is a question of whether the satisfaction the borrower gets from the

purchases is greater than the interest payments. It is basically a question of comparing costs and benefits (Rosen, 2010).

Mpekesa (1971) presents three main advantages of foreign public capital:

1. Insofar as they are lent for a long period on modest interest rate, they help LDCs investing into profitable projects and whose impact on national income is important;
2. They can help a developing country restructure its economy through modernization of the farming sector;
3. They can finance the economic diversification in order to diversify the economy and avoid the depreciation of trade terms (X/M).

In a word, external debt impacts on economic growth through investment. It helps to finance Government needs in terms of public investments. In the following title the theoretical linkage between debt and investment has been developed.

2.3.5. The Relationship Debt Investment

Debt has an effect on both, public and private investment.

2.3.5.1. Effect of Debt on Public Investment

As shown previously, in the literature there is no unanimity among authors when it comes to discussing the effect of debt on investment. Some authors advocate for the hypothesis of debt overhang while others think that indebtedness is source of funding for investment and economic growth. Sanchez and Almada (2016) established that sub-national governments hire debt for the purpose of financing public investment projects that complement private investment to translate into

greater economic growth, from which contracted debt becomes sustainable and there is no risk for their finances. Claessens and Diwan (1990) quoted by Ejigayehu (2013) also categorized the effect of external debt on investment and economic growth in two. First, debt servicing might put away (take) the limited resources of poor countries that could be used in public spending. More specifically, resources used to service the accumulated debt may crowd out public and private investment due to complementarities between private and public investment.

2.3.5.2. Relationship Public Debt-Private Investment

There exist two approaches of the relationship debt investment. The first one advocates that external debt promotes capital inflows with positive effects on domestic saving, investment and economic growth. This argument assumes that foreign saving is complementary to domestic saving. According to this approach debt is considered as an instrument of economic policy and a privileged mean for economic growth financing. Ideas related to this theory are drown from Keynesian model according to which indebtedness does entail cost neither for present generations nor for future generations because it generates new investments. In this approach, indebtedness promotes demand and multiplier effect. When limited, external borrowings used to finance productive investments accelerate economic growth (Bofoya, 2011).

The second approach developed the theory of over indebtedness or virtual weight of debt. Indeed, another group of author considers debt as a threat for investments. For Krugman (1989), if future debt of a country is higher than its pay back capacities, the debt service discourages investors. Fearing that production will be taxed by State to

cover the debt service, investors will not increase production in the future. Economic theory has recognized the existence of a threshold beyond which debt becomes unsustainable. Barro (1990) has demonstrated that a policy of budget deficit financed by borrowing could not have an effect on economic activity insofar as economic agents anticipate an increase of taxes to pay back debt.

Hayek (1989) denounced indebtedness as an artificial growth founded on an investment superior to the saving effort of a nation. For Krugman (1989), a high external debt has a negative impact on private investment. Economic agents and foreign investors consider the debt burden of external debt as a tax on their future income. This means that State will increase taxes in the future in order to face debt service. Also, an increase of taxes entails a weak income after tax on capital and then reduces the incitation to invest, hence a weak economic growth. In this case, debt is a marginal tax on investment.

As the side of the public debt increase, there is a growing uncertainty about actions and policies that the government will resort to in order to meet its debt servicing obligations, with adverse effects on investment. In particular, as the stock of public sector debt increases, there may be expectations that the government's debt service obligations will be financed by distortionary measures (the inflation tax, for example) as in Agenor and Montiel (1996). The extensive literature on uncertainty and investment suggests that in these circumstances, potential private investors will prefer instead to exercise the option of waiting (Serven, 1997). Moreover, any investment that takes place is likely to be devoted to activities with quick returns rather than to long term, high risk, and irreversible projects. Rapid accumulation of

debt can also be accompanied by increasing capital flight if the private sector fears imminent devaluation and or increase in taxes to service the debt (Oks and Wijinbergen, 1995).

2.3.5.3 Effect of Public Investment on Private Investment

Regarding the relationship between private and public investment, theoretical discussions carry on two effects: a positive and a negative effects. For Fitzgerald (1992), funding of public investment through its effect on inflation and debt accumulation can create uncertainty of business environment. Raffinot (1998) states that in developing countries public investment creates a real eviction for private companies because there is a shortage of market weight.

At the other side, according to theory of endogenous growth, governments may improve the efficiency of resources allocation. They can do this by providing public goods (infrastructures) or encouraging private investment in knowledge intensive industries where human capital can be accumulated and subsequent increasing returns to scale generated. Models of endogenous growth suggest an active role for public policy in promoting economic development through direct and indirect investments in human capital. Indeed technological change is endogenous outcome of public and private investments in human capital and knowledge (Todaro and Smith, 2012).

In few words, the theoretical literature review focuses on negative or positive effect of external debt on economic development in general and economic growth in particular. The conclusion of all theories developed is that the effect depends on

efficiency in the allowance of external borrowing. The following section makes an overview on the empirical literature review related to the linkage between external debt and economic growth.

2.4. Empirical Literature Review

Most of the theoretical literature review has been devoted to developing countries, though some authors have been interested in the phenomenon of foreign borrowing in developed countries. Empirical literature review in this thesis presents some research results related to some case studies which have been analyzed in both, developed and developing countries. As a result, most of researches have attempted to demonstrate positive or negative effect of external debt and its impact on development process in general, and economic growth in particular. Some of them present external debt as a threat for economic growth while others present it as an opportunity. There is no consensus on the role of external debt on growth. It has both positive and negative effect. Relationship between main concepts presented in the hypotheses of this research has been approached in this empirical literature review such as: economic growth, external debt, public investments, private investments…

2.4.1. External Debt as a Threat For Economic Growth

Rifaqat and Usman (2012) state that effects of external debt accumulation on investment and economic growth of a country are always remaining questionable for policy-makers and scholars alike. When external debt is accumulated beyond a certain limit, it contracts the economic growth by hampering investment. A leading

explanation for this negative relationship was called in the theoretical literature review debt overhang hypothesis, which states that high level of indebtedness discourages investment and negatively affects growth as future higher taxes are expected to repay the debt. Empirical evidence revealed that external debt exerts a negative impact on economic growth and clearly indicates that higher external debt discourages economic growth. For instance it has been verified the occurrence of debt overhang situation in Pakistan (Rifaqat and Usman, 2012).

Bauerfreund (2007) quoted by Ejigayehu (2013) finds a negative effect of external debt payment on investment in Turkish. He also points out poor internal and external economic policies as the main causes for the debt overhang problem. Arnone, et al. (2005) have also found out that large debt stock leads to capital flight, high tax rates and continuous over-borrowing with a negative effect on growth. Pattillo, et al. (2002) in their study analyzed the non-linear impact of external debt on economic growth taking large set of data for a period 1969-98 covering 93 developing countries. By applying econometric methodologies, regression specifications, and different debt indicators they observed marginal negative impact of debt on economic growth for about half of the values. These values indicated that high debt appears to reduce growth mainly by lowering the efficiency of investment rather than its volume.

Using the OLS method, Masika (2016) investigated the impact of external debt and external debt servicing on economic growth in the case of DRC. She proved from her results that the increase of external debt deteriorates economic growth in the DRC in short and long run. She found as result a negative impact and statistical

significant relationship between external debt and economic growth. The economic intuition behind this is that the more external debt is contracted in DRC, economic growth decreases due to the wrong orientation of the external debt in different sectors.

In the same angle, Siddique and Selvanathan (2015) examined short-run and long-run relationships between external debt and economic growth in 40 HIPC countries over the period of 1970-2007 with the aid of the growth accounting process. The impact of capital formation, trade and population growth on economic growth in these countries was also examined. Results indicate that capital formation has a positive impact on GDP in the short run as well as in the long-run; debt has a negative influence in the short run as well as in the long-run; and population increase has a positive influence on the economic growth. Kalonji , et al. (2003) in an attempt to explore the relationship between external debt and poverty on 67 low income countries during period 1985-1999 found that external indebtedness indicators have a limited but important impact on economy.

Fosu (1993) quoted by Ejigayehu (2013) tried to explain the effect of external debt over economic growth on sub -Saharan Africa countries by applying an augmented production function. He used the debt crisis period, 1980-1990 for the analysis. The main aim of Fosu (1993) quoted by Ejigayehu (2013) was to examine the debt overhang hypothesis directly. As per his result, the debt variables which are included in the model took a negative coefficient on the period 1980-1990. Result of Ejigayehu (2013) on effects of external debt on economic growth show that the impact of external debt on economic growth is statistically significant in terms of

debt crowding out effect over the selected eight countries in particular and over all the heavily indebted poor African countries in general in a restricted sense. In the other hand, the effect of external debt on economic growth is found to be statistically insignificant in terms of debt overhang effect. The equation regressed by Ejigayehu was $GDP = B_0+B_1GDP_{t-1} + B2ED+ B3n_{it}+B4DS+B5TB+B6Inv-3.69$ with:

i. GDP= Gross Domestic Product
ii. Inv= Investment
iii. TB= Trade Balance
iv. DS= Debt Service
v. n_{it}= Population
vi. ED= External debt
vii. E_t= Error terms

Ejigayehu used cross sectin data from 1991 to 2010 and the OLS Method.

According to Mulugeta (2014), external debt burden has assumed great influence in the economy and requires due attention of policy makers. Growing public debt and its servicing are indeed very serious macroeconomic problem, which lead to high inflation, low saving and affects on sovereignty of a country. That is, an increase in external debt servicing decreases GDP growth and there is evidence for existence of crowding out effect in Ethiopia. This case of Ethiopia is not surprising since the effect of debt on economic growth depends on its management.

Likewise, a study led by Diallo (2003) on the case of Guinea reached the conclusion according to which external debt acts negatively on economic growth, particularly when based on the ratio debt/export. An increase of that ratio of 100% entails a

decrease of growth of 631%. The total debt increases faster than the main source of external revenue of the economy. Ezeabasili, et al. (2011) came up with the same result as regards the case of Nigeria. In that country, one per cent increase in external debt resulted in decrease of 0.027 per cent in Gross Domestic Product, while a 1 per cent increase in total debt service resulted to 0.034 per cent decrease in Gross Domestic Product.

Chamkhi (2011) presents debt as a neocolonialist mechanism which prevents efforts of Tunisia related to its social and economic development to reach its objectives. He argues that debt prevents Tunisia to reach its social and economic objectives of development. Moreover debt repayment increases problems of Tunisian society. For Lemoine (2011), the issue of debt management is highlighted at this level. According to Ajili (2007), it should stress on elements of public policy. Instructions of World Bank and International Monetary Fund want debt management to match with monetary and fiscal policies.

2.4.2. External Debt As An Opportunity For Economic Growth

On the side of pessimistic results presented in the subsection 2.4.1. related to debt contribution to development and economic growth other researches are more optimistic, though they point out some unavoidable requirements. Different experts are of the view that external debt will have favorable effect on economic growth because it increases capital inflow and when used for productive investments can accelerates economic growth. In her thesis, Elouar (2009) claims that debt is an essential factor of development process if it is focused on productive activities which bring monetary surplus. Most of LDC don’t respect that requirement, their

debt are used for current expenses. Public debt is a constraint to public decisions we should agree with Jayaraman and Lau (2001) cited by Siddique and Selvanathan (2015). They found that higher debt levels can promote higher economic growth. Their study involves six Pacific island countries between 1988 and 2004 and is based on regressing external debt stock, exports and the budget deficit (all as a percentage of gross domestic products) against gross domestic product.

Lyoha (1999) found that debt stock reduction would have significantly increased investment and growth performance. A 20% debt stock reduction would, on average, have increased investment by 18% and increased GDP growth by 1% during the 1987-1994 period. Thus, the results demonstrate that debt forgiveness could provide a much needed stimulus to investment recovery and economic growth in sub-Saharan Africa. Ayadi (2008) investigated the impact of external debt with its servicing requirements on economic growth of Nigerian and South African economies using OLS method, covering period 1980-2007.

The researcher found that South Africa performed better than Nigeria in application of external loans to promote growth during the period of study. In the case of Nigeria, external debt contributed positively to economic growth up to an extent after which its contribution became negative. In the case of European Union, Shesherita and Rother (2010) led a study in which they noticed that on average for the 12-euro area countries, government debt-to-GDP ratios above such a threshold would have a negative effect on economic growth. The negative growth effect of high debt may start already from levels of around 70-80% of GDP, which calls for even more prudent indebtedness policies. Krumma (2000) quoted by Ejigayehu

(2013) argues that, if the available external loan improves the productive capacity of the borrowing country it is unnecessary to take extra external loan to service the original debt.

Regarding the case of Tanzania, Upendo (2015) reached results that there is positive and significant effect of external debt on economic growth and debt service has negative and significant effect on economic growth. The sample was taken from yearly rang data of 1990-2013 i.e. 24 observations. The method of analysis was OLS. A multiple regression was formulated including GDP growth rate as the dependent variable, external debt and debt service as the independent variables. In order to determine the long run relationship, the author employed Johnson co-integration test. The coefficient of determination found was 0, 5333. This explains that about 55,3% variation of economic growth in Tanzania is explained by external debt and debt service while the remaining percent could be explained with other variables not included in the model. He found also that a unit increase in external debt leads to 4, 27 unit increase in economic growth. Shrithongrung and Kriz (2014) cited by Sanchez and Almada (2016) show with data of American economy and the method of Panel vector Regression, that public capital has a positive effect on growth in the short and the medium term.

2.4.3. Effect of Debt On Private Investment

Regarding the effect of debt on private investment, Cléments, et al. (2003) in their study on the relationship external debt, private investment and economic growth in fifty five low income countries have reached the following results:

i. A high stock of external debt does not jeopardize private investment

ii. External debt has an effect on economic growth through public investment and does not depress private investment.

Results of Cohen (1993) on the correlation between debt and private investment in developing countries during the decade 1980 show that the high level of debt does not have a big impact on the explanation of private investment decrease. Burak and Raffinot (2001) have concluded that in Turkish, external debt had a positive effect on private investment during the period of industrialization.

Boris (2012), with data from 20 European countries for the period 1985-2010 and applying the method of fixed effect panel and causality test found that economic growth is what determines public debt and that public debt negatively affects total investment. According to his work, when an economy ceases to grow, public borrowing is used and this harms investment and is detrimental to growth, plunging the economy into stagnation. These results favor the paradigm of austerity in public finance as a stabilization mechanism and the hypothesis of crowding out of private investment. Bauerfreund (1989) quoted by Ejigayehu (2013) found a negative effect of external debt payment on investment in 1985. He also pointed out poor internal and external economic policies as the main causes for the debt overhang problem.

Opposite to Bauerfreund findings, Warner (1992) quoted by Ejigayehu (2013) got a positive relationship between external debt and investment. The analysis was carried out on 13 less developed countries over the period 1982-1989 using least square estimation. However, this result can be criticized because the sample chosen is small. Seven years are not sufficient to lead an econometric analysis. Oyo and Oshikoya

(1995) led an econometric analysis on panel data (68 Countries, period 1970-1991) and validated the hypothesis of debt burden for African countries in general: into equations which explain the growth rate they found that a reduction of indebtedness rate (ratio external debt GNP) of 10% entails an increase of growth rate of African economies of 0, 3%. Likewise, a decrease of indebtedness rate of 10% entails an increase of investment of 0, 4%.

Desphande (1997) led a research on thirty highly indebted countries from 1971 to 1992 and found a negative relationship between the level of external debt and private investment at 1% critical value. He concluded that the debt burden impacts on private investment through the direct effect of discouragement which pushes investor fearing that invested funds will be used by State to cover debt service. Hjertholm (1998) reached the same results using panel data for a sample of fifty three weak income countries during the period 1970-1999.

UNECA (1998) has examined the dynamic effects of external debt on private investment rate in Africa. The article shows that when a country goes beyond a critical threshold of debt accumulation, negative effects appear. The study affirms that external debt has led to the decrease of private investment. According to conclusion of UNECA, the debt burden starts affecting private investment from the critical threshold of 33, 5% debt accumulation (in relation to GDP). In the case of Phillipines, Borenzstein (1991) cited by Ejigayehu (2013) concluded that external debt has a dissuasive effect on private investment. According to the study a high indebtedness rate reduces indirectly productive investment in two ways: high domestic interest rate, weak profitability because weakness of economic activity.

Were (2001) has evaluated the effect of external debt on investment and economic growth in a study conducted on the case of Kenya (1970-1999). His conclusion is that current debt flow stimulates economic growth while prior debt flow does not. He demonstrated that the debt service ratio evicts private investment at a threshold of 12%.

2.4.4. Effect of Debt On Public Investments

The effect of debt on public investment has been examined notably for the case of Mexican economy. Sanchez and Almada (2016) have demonstrated evidence of the relationship between public debt and public investment, as well as between public investment and economic growth. They built a database with information from 1993 to 2012 for the 32 states that make up the Mexican Republic. They used eight variables: population, total output or production, output per person, public investment, current government spending, average years of schooling, foreign direct investment and public debt. The first estimated equation shows that the output per capital is determined by lagged value of output, foreign direct investment, years of schooling, foreign direct investment and public debt. The second estimated equation explains that the public investment itself is determined by lagged public investment, current expenditure of government, population, foreign direct investment and public debt.

Results of the research show that:

i. Public debt is positively correlated with output per person with a significance level of 0, 01. Therefore public debt is a determinant of economic growth. It is the same for public investment because it has a positive effect on output per

person with a significance level of 0, 01.

ii. The variable interaction between public investment and public debt is statistically significant at 0, 01. This confirms the hypothesis according to which the debt which is channeled for public investment collaborates to observe a greater economic growth.

For the case of Low Income Countries, Benedict, et al. (2003) demonstrated that external debt has an indirect effect on growth through its effect on public investment. However debt service has a negative effect on public investment. On average every 1 percentage point increase in debt service as a share of GDP reduces public investment by about 0, 2 percentage point. In short, the Laffer curve hypothesis is confirmed by most of empirical researches: debt may contribute to economic growth if moderated but beyond a certain threshold, it becomes a threat in the development process. That is why, it is important to examine policy implemented by Government of Rwanda in order to make external debt profitable to the country in terms of economic growth.

2.5. Policy Review and Debt Sustainability Analysis

2.5.1 Policy Review

In Rwanda, a legal framework related to debt management has been adopted. It is called legal basis for debt management. Nevertheless, strategies related to debt management are summarized into the policies related to debt management in Rwanda which comprises all issues on debt management notably currency composition of the debt portfolio, debt sustainability, external loan negotiation,

accountability and external debt strategy. The broad objective of debt management in Rwanda is to meet government financing needs within the provisions of the development plans (EDPRS and Vision 2020) whilst ensuring timely payments of obligations at least cost possible.

Borrowing is expected to be consistent with the cost risk preferences of GoR, while maintaining total debt at sustainable levels in the medium to long term. The objective is also to ensure domestic debt market development in the long term. Government of Rwanda has set a number of policies aiming at well managing external debt. It is about measures taken by GoR which summarize strategies of Rwanda related to external debt management notably: concessionality of external debt, public investment program, external debt strategy.

Rwanda has recognized the important role that external financing both grants and loans and domestic debt development may play in the realization of economic growth targets as articulated in the economic development plans that is, the Economic Development and Poverty Reduction (MINECOFIN, 2003).The role of external borrowing in the process of development and economic growth is explained by the intervention of the State in economic activity of Rwanda. External borrowing allowed having an increase in the rate of investment and thus economic growth (BNR, 2004).

The Government of Rwanda requires large external flows to finance and implement its ambitious economic development programs. Domestic financial resources from domestic revenues, domestic borrowing and others are currently not sufficient to

finance the development plans. While the GoR prioritizes access to external grant financing, it is unlikely that the latter will be sufficient to cover the financing gap. This entails that external borrowing is required to cover the deficit especially for capital projects. The articulated need for borrowing for development purposes in the future has created a need to guide the borrowing activities both on the external and the domestic side. The need has also arisen to guide the long term domestic debt development process (MINECOFIN, 2003). GoR considers as public debt all debt procured within the provisions of the OBL and executed by the legally designated agent of the GoR.

In the short and medium terms, GoR prioritizes grant financing over loan financing. Debt financing is considered for capital projects and other economically viable programs which are required to attain Rwanda's development objectives. More specifically, the GoR prioritizes debt to finance projects that will contribute directly to GDP growth, capital formation, job creation and increase of export revenues. GoR refrains from borrowing for recurrent expenditures. Indeed, total debt is considered fully sustainable when Government domestic revenue is higher than the total current expenditure (including debt service). This implies that the GoR collects sufficient revenue to cover all recurrent expenditures and saves financial resources to service the debt that is external and domestic debt (MINECOFIN, 2003).

In one word, in Rwanda there exists a debt policy which focuses on good management of external debt, that is, its orientation towards investment projects aiming at improving economic growth. The implementation of this policy allows to avoid inefficiency of external debt since most external borrowings are oriented

towards investments useful for encouraging private investments. Hence, the research gap of this study on the case of Rwanda allows understanding at which level this study is different from previous ones as summarized in the literature review.

2.5.2. Debt Sustainability Analysis

Debt is sustainable if the government does not, in the future, need to default or renegotiate or restructure its debt or make implausibly large policy adjustments (Cassimon D. et Al., 2016). The enhanced HIPC Initiative considers a country's debt to be sustainable if the net present value (NPV) debt-to-export ratio is maximal 150 percent, based on the debt sustainability analysis at the enhanced HIPC decision point. In cases where a country has both an export-to-GDP ratio of at least 30 percent and government revenue-to- GDP ratio of at least 15 percent, the enhanced HIPC framework considers also a fiscal window, whereby it is assumed that a country's debt is sustainable if the NPV debt-to government revenue ratio is maximal 250 percent (IMF/IDA, 2005).

Over time there have been different indicators and thresholds used internationally to assess the debt sustainability of low income countries. With the introduction of the HIPC Initiative in 1996, and its enhancement in 1999, the key indicators used to evaluate a country's debt sustainability became the following:

i. Net Present Value of debt to Export ratio
ii. Net Present Value of debt to GDP
iii. Net Present Value of debt to revenue
iv. Debt Service to export ratio
v. Debt Service to revenue

In the case of Rwanda, debt sustainability analysis reveals that, the country is not at high risk because all debt indicators are below thresholds as shown in the table above. At the end of the debt sustainability analysis led by IMF in 2016 GoR of Rwanda agree that having in place a prudent medium-term debt management strategy, and carefully prioritizing future projects and their financing are necessary to contain public debt vulnerabilities (IMF, 2017).

Table 2.1: Debt Sustainability Analysis

Solvency Ratios	Threshold	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2017
NPV/Export (%)	150%	74.7	75.1	78.9	81.2	82.6	84.1	85.0	95.6	110.0	101.0	93.7
PPV/Revenue (%)	250%	61.4	63.9	64.3	67.7	70.1	70.3	75.2	86.4	97.6	90.6	84.4
NPV/GDP	40%	6.2	6.7	7.3	8.2	8.8	9.2	10.2	11.9	13.9	13.2	12.5
Debt service/Export	20%	2.0	3.4	2.6	1.4	3.0	1.3	2.5	2.4	3.7	3.7	3.7
Debt service/Revenue	30%	1.1	1.6	2.0	2.4	1.0	1.1	2.3	2.2	3.3	3.3	3.3

Source: IMF and MINECOFIN staff calculation

The table above indicates that all Rwanda's debt indicators are below the policy-dependent indicative thresholds; reveals also that Rwanda remains in a sustainable debt position. In 2010, the net present value of debt to exports was 84.1% and rise to be 110.0% as maximum in 2013 thereafter. It is expected to decline slowly to be 63% by in 2030 well below the acceptable threshold of 150%.

The NPV of debt to GDP ratio and NPV to revenue ratio remain well also below their thresholds throughout the forecast period, while debt service payments continue to be manageable at below 5% of export of goods and services and government revenue. Typically, of all the debt sustainability indicators, the NPV of debt-to-export ratio is used as key indicator. For Rwanda, this represents a binding constraint since the country's export receipts are the primary means of meeting debt service obligations. Additionally a high ratio indicates a greater burden of debt servicing. A growing ratio especially if the level of debt is already high implies that we are on an unsustainable path.

The results of the external DSA confirm that Rwanda's debt dynamics are sustainable, but Rwanda continues to have vulnerabilities owing to its low export base; an assessment that is unchanged from the previous DSA. Specifically under the baseline assumptions, all indicators of public and publicly guaranteed external debt stay well below their respective thresholds. The DSA suggests that there is room for some non-concessional borrowing to meet the country's large infrastructure investment needs without unduly increasing Rwanda's risk of debt distress.

2.6. External debt and GDP evolution

2.6.1. External debt evolution

Before presenting results of analyses let's make an overview of external debt evolution. Rwanda external borrowings are made up with loans since the 1970s. They began to reach alarming proportions in the early 80s when coinciding with the collapse of coffee, tea and cassiterite price which were the main export products, but the problem of payment which occurred was caused by the accumulation of some arrears. Important arrears began with the 1990s. Actually, debt repayment consumes resources that could instead be allocated to fight against poverty.

Rwanda's debt is either indoors or outdoors. For domestic financing, Rwanda uses its National Bank (BNR), other financial institutions and non-bank operating in Rwanda as well as individuals, by issuing treasury bills and development bonds. As for external financing, Rwanda resorts to foreign governments (bilateral debt) or international funding institutions (multilateral debt). In Rwanda, public debt remains dominated by foreign debt. Generally it is contracted to overcome liquidity problems faced by the public power and sometimes for reasons of monetary policy. The consequence of a domestic debt is to absorb domestic savings which could be, otherwise used to promote private investments (MINECOFIN, 2012).

In short, as it is the case of external funding, the country resorts to foreign governments to have access to bilateral debt or international financial institutions to have access to multilateral debt. As said previously, main factor explaining the resort to external and domestic debt is the permanent deficit of the Rwandan public budget

while the State must annually provide sufficient resources to pursue development goals. The public debt is unavoidable in this process of deficit financing. Considering difficulties with the conditions encountered in the negotiation of foreign loans, Rwanda is sometimes obliged resorting to domestic borrowing to meet immediate expenses.

Borrowing from outside Rwanda, consisting mainly of long-term loans, the public external debt is a complement to domestic saving. Hence, the need for good coordination between the management of external debt and other macroeconomic policies. Foreign loans have financed a large volume of investment, contributing to the available resources of the country. Rwanda's external debt remained predominantly composed of multilateral debt. Multilateral debt is a debt the Government of Rwanda contracts from international financial institutions like International Monetary Fund, World Bank, Arabic Bank of Development, African Bank of Development. The research has focused on external debt with its two main components: multilateral and bilateral debt. Thus in the sub-section below their evolution in Rwanda was described.

Evolution of Rwanda multilateral debt: Accumulation of external debt is a common phenomenon of developing countries at the stage of economic development where the supply of domestic savings is low, current account payments deficits are high, and imports of capital are needed to augment domestic resources. Like other African countries, Rwanda resorts to external debt as exceptional resource so as to cope with deficit.

The evolution of multilateral debt of Rwanda is presented in the following graphic:

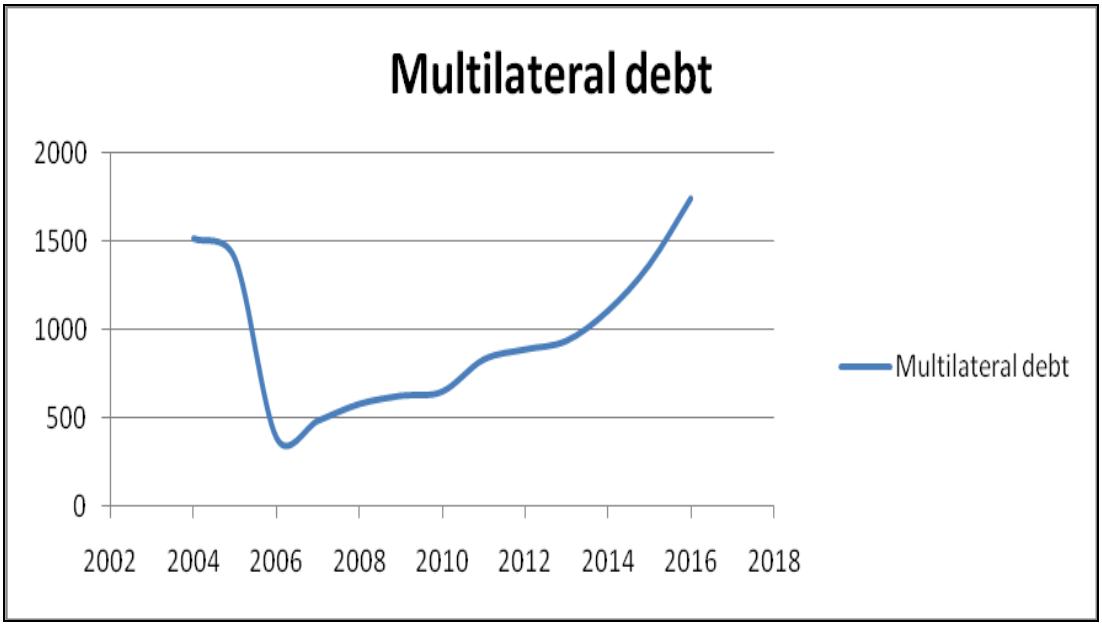

Figure 2.2.: Evolution of Multilateral debt of Rwanda from 2003 to 2016 (million USD)
Source: MINECOFIN, Annual report, 2017

Multilateral debt has increased in most of the period of study. For instance from 2008 to 2016 it grew from 581 million to 1744 million. Due to debt cancellation by most creditors, once Rwanda had reached the completion point, decrease was observed in 2006. The debt went from 1518 million in 2004 to 1403 million in 2005, to 486 million in 2006. However, after the cancellation, multilateral debt of Rwanda started increasing up to 2016.

Evolution of bilateral debt: Bilateral debt is the one Government of Rwanda contracts from other States through bilateral cooperation. The figure below presents Rwanda's debt evolution:

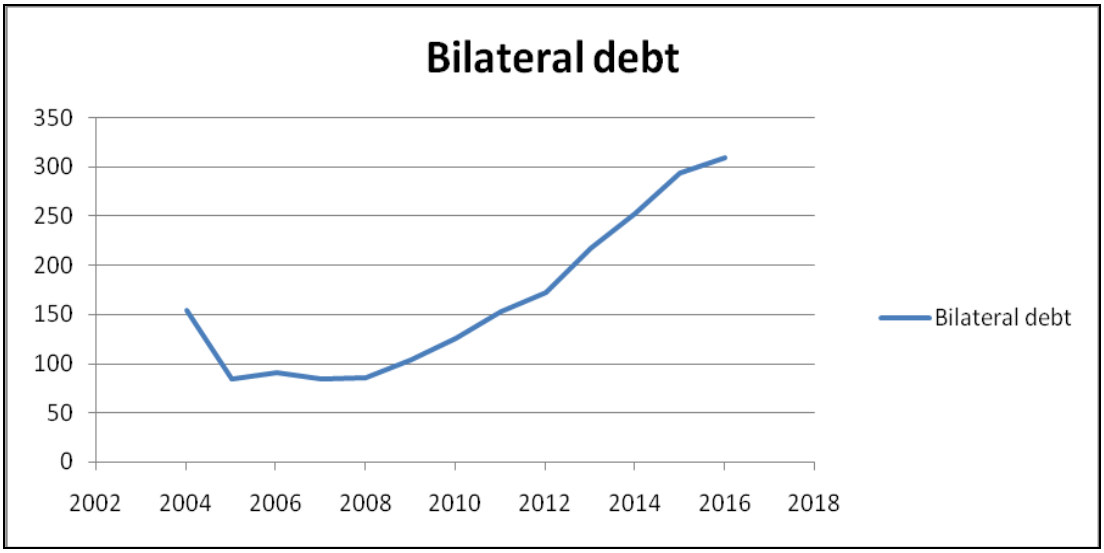

Figure 2.3.: Evolution of Rwanda's Bilateral Debt from 2004 to 2016 (million USD)
Source: MINECOFIN, Annual report, 2017

Bilateral public external debt had followed the same trend like multilateral debt. Two years following the completion point in 2005 the level of indebtedness remained low. From 2008 to 2016, external bilateral debt did not stop increasing, moving from 84 million USD in 2008 until 309 million USD in 2016. The lesson learned from this positive evolution of both, bilateral and multilateral debt after the completion point is that cancelling the debt of developing countries is not a solution to public debt issue which is linked to the economic situation of such countries. Rather, every country should enforce a macroeconomic policy likely to help improve macroeconomic indicators in order to get more taxes and reduce current expenditures.

Evolution of Rwanda's total external debt: As far as evolution of external debt is concerned, distinction must be made between two periods: before completion point (2005) during which the biggest part of external debt of Rwanda had been cancelled and the period after completion point.

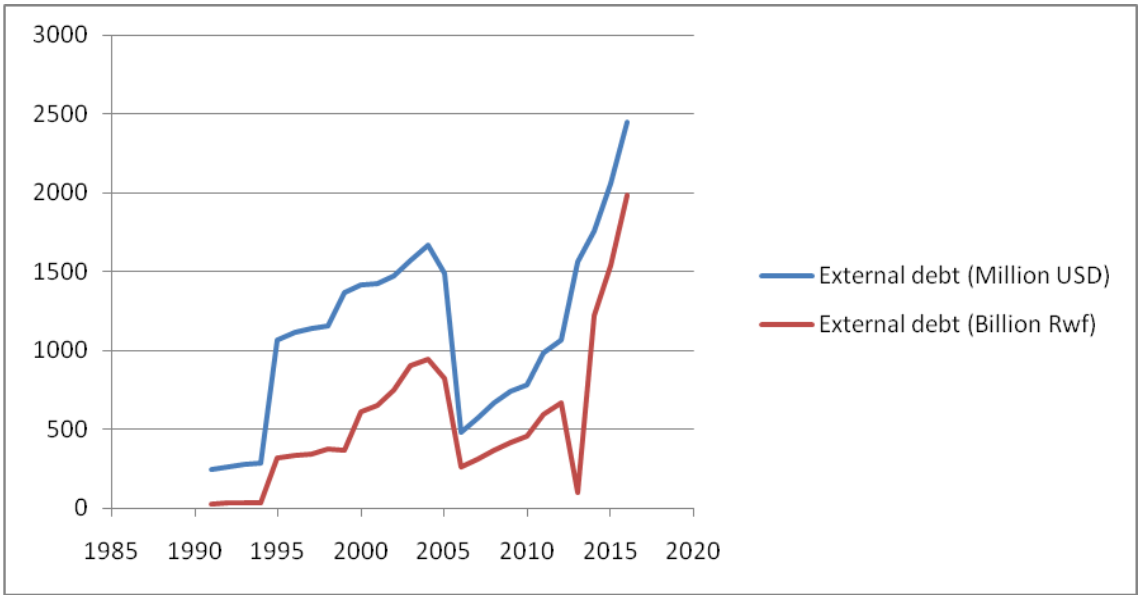

Figure 2.4.: Evolution of Rwanda's External Debt Before and After the Completion Point

Source: MINECOFIN, Annual Report 2017

The above graph shows the evolution of external debt in Rwanda during the period of 1991 to 2016. As indicated on the figure, external debt in Rwanda increased significantly year by year. The low level of external debt in Rwanda in 1994 is explained by political instability of Genocide, where all the economy was affected by that event. We notice a big change of external debt in Rwanda from 1486.8 million USD in 2005 to 479.7 million USD in 2006.This change is due to debt relief and cancellation Rwanda took benefit of when it reached the completion point.

This situation was the result of multilateral debt cancellation conducted by the G8 countries in favor of the 18 countries that have reached the completion point, including Rwanda. The Government of Rwanda uses external debt in order to finance infrastructures such as roads, construction of hospitals, education… In fact, the rehabilitation and creation of new activities requires the availability of significant

funds. Figures in the graphics above show once more that, the completion point has not solved the problem of Rwanda indebtedness. From 2006, first year after the completion up to 2016, the external debt of Rwanda has increased more than fivefold moving from 479, 7 million USD up to 2451, 9 million USD, an increase of 411%.

2.6.2. GDP evolution

The figure 2.4. shows that in general, GDP of Rwanda has been growing from 1994 up to 2016.

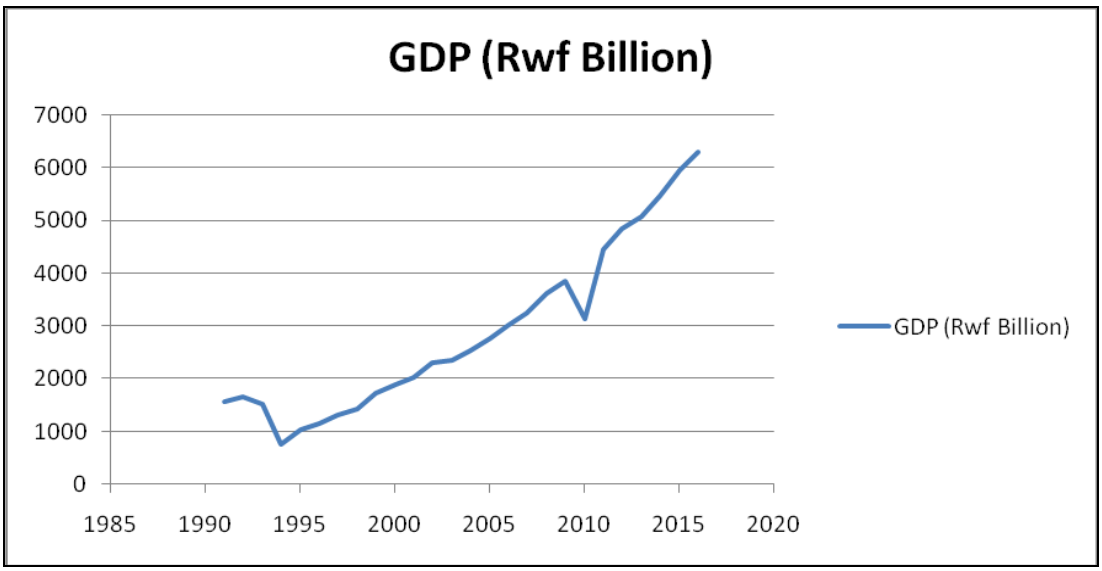

Figure 2.5.: Rwanda GDP Evolution in billion Rwf (1991-2016)

Source: NISR and MINECOFIN, Annual Report 2017

In general, the period of study, highlights an increase of GDP, as reflected by the figure 4.6. The decrease noticed in 1994 is the consequence of war and genocide which took place that year while the one of 2009 is explained by the international financial crisis. As regards the particular case of Rwanda, the international financial crisis provoked the decrease of price of tea and coffee, two main products exported by the country.

2.7. Research Gap

As shown at the beginning of this chapter, an abundant literature review on external debt exists around many aspects focusing on causes of external debt or its economic justification, effects of external debt on investment, and effects of external debt on the economic growth. Many authors have been interested to the issue of external debt. From famous economist like Keynes to Krugman, Perkins and Todaro, debt has been presented as an opportunity and sometimes as a constraint for developing countries with recurrent public deficit.

Economic literature shows that external debt phenomenon is linked to the phenomenon of budget public deficit. Indeed, when Government fails to finance public deficit through internal resources that is increasing taxes, using bank note plate, or internal debt, the remaining solution is external debt. This aspect of deficit financing had been developed in the economic literature by authors like Krugman and Obsfield (2012). Resorting to internal resources is better for the country but once more literature has shown that each type of funding presents disadvantages, and then, can become harmful to economy. Mouhoud (2006), Geloso (2011) and other authors widely discussed the negative consequence of taxes increase. Internal debt creates, in long term, an eviction effect while bank note plate creates inflation.

Since deficit is a common phenomenon of low developed countries, considering their incapacity to generate more income or organize more activities in order to recover more taxes, external grants being insufficient, they have to support the burden of external debt. External debt is presented by many authors as a burden since it presents negative consequences on the economy. Aryeejey (2012) considers

that the debt burden significantly threatened Africa's hope of future economic growth recovery. Other author like Human (1996), Abel and Bernanke (1995), Atkinson and Stiglitz (1980)… highlighted the negative consequence of debt showing that it threatens the economy because of its negative impact on future generations. Its weight on economic indicators is evaluated when government has to pay the principal and interest of external debt, what is called debt service.

However, more optimistic views have been developed about effect of external debt. From the literature we have learned that the way external funding is utilized is the factor that determines the consequence of external debt on the economy. For example Adda (1997) states that some Asian and African countries had taken benefit of the financial basket for the best when borrowed funds were allocated to profitable investments likely to increase supply of exports and reduce imports, the worth when findings are used to finance increase of consumption of imported products or to finance current expenses of State. According to Rosen (2010), if a loan is used to finance capital accumulation, the outcome depends on the project's productivity. If the marginal return of the investment is greater than the marginal cost of funds obtained abroad, there is no burden on future generations. Therefore, in the economic literature, there is no common understanding on the effect of external debt. Some authors emphasize positive effects, whereas others highlight negative effects of external debt.

In the same angle, the empirical literature review presents results of external debt effect on economy and which contradict themselves. Investigations led in 67 low-

income countries by Kalonji, et al. (2003) revealed that external indebtedness indicators have a limited but important impact on economy. However, researches on cases of some countries like Turkey, Ethiopia, Guinea rather showed a negative relationship between external debt and economic growth. This antagonism of results makes the basis of discussions in this research insofar as results regarding the contribution of external debt to the economic growth differ from country to country. This is why the main concern in this thesis is to know which factors explain such difference of results using the case of Rwanda.

The gap between previous researchers and this study is that none of these previous investigations had supplied further explanations on factors explaining the positive or negative correlation between external debt and economic growth emphasizing the relationship between external debt and public investment as well as private investment. Hence in this thesis other models have been analyzed in order to investigate the efficiency of external debt in Rwanda. The departure point is that external debt acts directly on public investment and indirectly on private investment.

External debt finances public investments create positive externalities of production for private investment. Furthermore the thesis attempts to explain for the case of Rwanda, which factors may explain the correlation between external debt and economic growth i.e. positive externalities created by public investment. In a word, conclusion of this thesis turns around concepts of externality and eviction effect apart from economic growth and external debt which are the main concepts of this research.

2.7 Conceptual Framework

Jabareen (2009) defines conceptual framework as a network of interlinked concepts that together provide comprehensive understanding of a phenomenon or phenomena. The concepts that constitute a conceptual framework support one another. In a research, concepts are related to one another in order to explain the phenomenon under study. In this research as specified in the chapter three related to research methodology, some concepts are called dependent variables, others are called independent variables. The logic around this study is that economic growth of Rwanda is influenced by external debt since the later allows financing project of infrastructures useful for boosting the economy. Projects financed belong to government strategies of development. Infrastructures are public investments which exert externalities on private investment.

In few words, concepts that relate to one another and which have been used to explain the research problem are: external debt, public investment, private investment and economic growth. Since economic growth is influenced by other factors developed in the research methodology, namely gross capital formation, labor force, exports and government expenditures, the conceptual framework of this study is summarized based on the following equation:

$GDPt = f\ (LF, GCF, EXTD, PEXP, EXP)$ (1)

Thus, main regression equation developed is:

$$GDPt = a0 + a1LF + a2GCF + a3EXTD + a4PEXP + a5EXP + \varepsilon t \quad (2)$$

GDP= Gross Domestic Product at constant price

LF= Labor Force

GCF= Gross Capital Formation

EXTD= External Debt

PEXP= Public Expenditures

EXP= Exports

a 0 = Constant

a 1 to a 5 = coefficients

By assumption a 1> 0, a 2>0, a 3 > 0, a 4 > 0, a 5 > 0

As it can be noticed through the empirical literature review, the relationship may be positive or negative.

As said previously, external debt acts on economic growth through public investments that create an external effect of production on private investment. Hence in this research two other equations have been formulated. The first one makes a linkage between public investment and external debt. It is presented as following:

$$\text{PubInv} = \alpha\,0 + \alpha\,1\ \text{PubInv}\ t\text{-}1 + \alpha\,2\text{ExtD} + \alpha\,3\ \text{Tx} + \varepsilon t \qquad (3)$$

The second equation makes a relationship between external debt and private investment. Its linear form is:

$$PrInv = a_o + a_1 PrInv_{t-1} + a_2 IR + a_3 GDP + a_4 EXTD + E_t \qquad (4)$$

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is a systematic way to address a problem. It displays how research is to be or has been carried out. Essentially, these are procedures used by researchers to go about their work describing, explaining and predicting phenomena. It is also defined as the study of methods with which knowledge is gained. It aims at providing the work plan to research (Rajasekar, et al., 2013). Research requires use of tools or instruments to collect data and this chapter intends to make an overview of such tools. In this chapter, topics like study area, research design, sample size, data collection, model specification, data analysis and processing have been developed.

3.2 Study Area

The area for this research is the territory of Rwanda. So, the analyses conducted are of macroeconomic nature. Rwanda is a landlocked country located in central Africa. It is bordered by Uganda to the North, Tanzania to the East, Burundi to the South and the Democratic Republic of Congo to the West. According to Rwanda Development Board (2012), the country surface area is 26 338 square kilometers. The total population of Rwanda is 11 920 000 inhabitants. The GDP per capita is 729 USD at current price while the currency is Rwandan francs (MINECOFIN, 2017).

3.3 Research Design

Research design is a plan, structure and strategy of investigation so conceived as to

obtain answers to research questions or problems. The plan is a complete scheme or program of research which includes an outline of what the researcher will do from writing the hypotheses and their operational implications to the final analysis of data (Ranjit, 2011). An architect is said to design a building. In the process of designing he considers each decision that is required to be made in constructing the building. He designs because he wants to get a picture of the whole before starting the construction. The picture helps him to visualize clearly the difficulties and inconveniences that users of the building would possibly encounter in relation to the plan. This can be applied with equal force to any research (Bhandarkar and Wilkinson, 2010).

If we anticipate before we conduct a research enquiry the various difficulties that may have to be encountered in the course of this exercise, we decide what to do about these. Then, we increase to that extent our chances of rationality controlling and articulating the research procedure. The major design decisions are reference to the following aspects: justification of the research, data and way to find them, area of the study, time the study includes, material to be used, techniques to gather data, data analysis methods and how to minimize money, time,…(Bhandarkar and Wilkinson, 2010).

This research requires use of quantitative data. A descriptive research design was led to present evolution of external debt and GDP. So, there are descriptions, explanations (interpretations) and analyses. Time series annual data from 1991 up to 2016 were used. In economics and business research, researchers often obtain data relating to a phenomenon over a time of period. Such data are called a time series. A

time series is a set of ordered observations of a quantitative variable taken at successive points in time in terms of years, months, weeks, days or hours (Krishnaswami and Ranganatham, 2011).

3.4 Sample Size and Research Philosophy

3.4.1 Sample Size

For the purpose of this study, the sample has been taken from yearly range data of 1991-2016.

3.4.2 Research Philosophy

The research philosophy for this study is positivism. Positivists believe that reality is stable and can be observed and described from an objective viewpoint i.e. without interfering with the phenomena being studied. They contend that phenomena should be isolated and that observations should be repeatable. This often involves manipulation of reality with variations in only a single independent variable so as to identify regularities in, and to form relationships between, some of the constituent elements of the social world (Levin, 1988). The research was about to make a linkage between a dependent variable and several independent variables. Therefore the positivism philosophy led investigations in this research because the approach used was quantitative.

3.5 Data Collection

For the sake of this research, secondary data were mainly used. The secondary data are those which have already been collected by someone else and which have already gone through statistical process. In case of secondary data the nature of data

collection work is merely that of compilation. Secondary data may either be published data or unpublished data (Kothari, 2004). They can provide a useful source from which to answer, or partially to answer the research question (Saunders, et al., 2012).

Usually published data are available in: (a)various publications of the central State i.e. local governments; (b) various publications of foreign governments or of international bodies and their subsidiary organizations; (c) technical and trade journals; (d) books, magazines and newspapers; (e) reports and publications of various associations connected with business and industry, banks, stock exchanges, etc.; (f) reports prepared by research scholars, universities, economists, etc. in different fields; (g) public records and statistics, historical documents, and other sources of published information (Kothari, 2004).

Data used in this research are data published by public institutions in Rwanda: MINECOFIN, BNR and NISR. Secondary data collected have to be reliable, suitable and adequate (Kothari, 2004). As regards this study data collected fulfill those attributes because:

i. They have been drawn from official documents (annual reports). There do exist an official institution in charge of gathering data on the economy of Rwanda which is the National Institute of Statistics of Rwanda;
ii. There do exist logic among them: for example there is no very big difference between data from a year to another one except the year 1994 during which most of variables present a small figure because of less activities during the war and genocide;

iii. They match with the period of study.

For the sake of this research data related to evolution of the external debt of Rwanda from 1991 to 2016 were collected. Other data collected were related to the evolution of GDP, debt, public investment, tax, private investment, GCF, etc. Reports which have been consulted include those of the Ministry of finance and National Bank of Rwanda, the International Monetary Fund, the African Development Bank, etc. The observation technique was used because during the research process it was mandatory to visit the service in charge of debt in the ministry of finance as well as the service in charge macroeconomic analyses in Rwanda. Also, some projects financed by external debt are observed, especially those related to roads construction and electrification.

3.6 Model Specification and Explanations on Variables

3.6.1 For Objective One

The first objective of this research is to analyze the effect of external debt on public investment. The econometric model related to this objective is inspired from the model developed for the case of Mexico by Ramirez and Erquizio (2012) cited by Sanchez and Almada (2016) while explaining the effect of public debt on public investment. The model was formulated as follows:

$$\text{Inver it} = \alpha 1 \quad \text{Inver it} - 1 + \beta i \ \text{Xit} + \mu i \ \text{deuda it} + \varepsilon it \qquad (5)$$

X_{it} stands for foreign direct investment.

Inver $_{it}$ = Public investment

Inver $_{it-1}$ = Lagged public investment

deuda $_{it}$ = Public debt

Tax has been added in the model specification since a part of public investment in Rwanda is financed by tax. Therefore the following model has been formulated to demonstrate the effect of external debt on public investment in Rwanda:

$$PubInv = \alpha\,0 + \alpha\,1\ PubInv\ t\text{-}1 + \alpha\,2ExtD + \alpha\,3\ Tx + \varepsilon t \qquad (6)$$

Where:

PubInv = Public Investment

PubInv $_{t-1}$ = Lagged Public Investment

ExtDt = External Debt

T_x = Taxes

εt= Error term

α_0 = Constant

α_1, α_2 and α_3 are coefficients of lagged public investment, external debt and tax respectively.

The variable lagged public investment measures the effect of previous year public investment. Its expected sign is positive.

A tax is a payment deducted by Government from taxpayers according to their ability to pay, using constraints, without direct compensation in order to cover public loads (Mankiw, 1997). Taxes are supposed to have a positive effect on public investment because they are used notably for infrastructures.

Expected signs are presented in the following table:

Table 3.1.: Expected signs and parameters for the econometric model objective one

Parameters	α_1	α_2	α_3
Expected signs	+	+	+

Source: The Author

The expected signs of α_1, α_2, α_3 are positive because a positive effect of lagged public investment, tax and external debt on public investment is expected.

3.6.2 For Objective Two

The second objective of the study is to demonstrate the relationship between external debt and private investment. Most theoretical and empirical studies presented above have highlighted the effect of external debt on investment. The model developed in this research is inspired from previous studies on the relationship between external debt and private investment, notably:

i. The thesis of Laffer curve developed by Patillo, Poirson and Ricci (2002);
ii. The Keynesian theory related to external debt;
iii. The neo-classic model related to the behavior of investment function according to which the level of investment depends on interest rate and income.

Therefore, the investment function selected is presented as following:

$$PrInv = f(PrInv.t\text{-}1, IR, GDP, EXTD) \quad (7)$$

The model is:

$$PrInv = a0 + a1PrInv.t\text{-}1 + a2IR + a3GDP + a4EXTD + \varepsilon t \quad (8)$$

In this model:

P_rInv = Private investment

P_rInv_{t-1} = Lagged private investment

IR = Interest rate

GDP = Gross Domestic Product

ExtD = External debt

Expected signs are presented in the following table:

Table 3.2.: Expected Signs and Parameters for the Econometric Model Objective2

Parameters	α 1	α 2	α 3	α 4
Expected signs	+	_	+	+

Source: The author

The expected signs of α_1, α_3 and α_4 are positive because a positive effect of lagged private investment, GDP, public investment and external debt on private investment is expected. However, the coefficient of α_2 is negative because according to the economic theory, there do exist a negative relationship between interest rate and private investment.

Explanations on Variables

Private Investment

Private investment is capital acquired by firms and individuals. The simple investment function relates investment to real interest rate.

I= I(r)

That function states that an increase in the real interest rate reduces investment (Mankiw, 2016). There are three types of investment spending:

i) Business fixed investment : equipment bought to use in production;

ii) Residential investment : new housing;

iii) Inventory investment: goods put aside in storage.

Investment depends on interest rate because an increase in real interest rate raises the cost of capital; it therefore reduces the amount of profit and incentive to accumulate more capital. The investment function can be represented by the following figure:

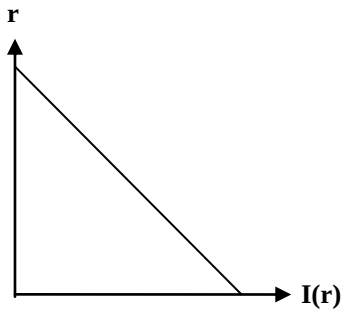

Figure 3.1: The Investment Function

The variable lagged private investment: It measures the effect of previous year private investment. Its expected sign is positive.

The variable public investment: Public investment is investment of State mainly related to infrastructures. Data related to public investment in Rwanda have been collected from the National Institute of Statistics of Rwanda

The interest rate: It is the rate that investors pay to borrow money. This is called nominal interest rate. The real interest rate is the nominal one corrected for the effect of inflation (Mankiw, 2016). It reflects the interest on long run borrowings of

commercial banks. Data related to the interest rate evolution in Rwanda have been collected from the National Bank of Rwanda. The expected sign for interest rate in the model to be developed is negative basing on the economic theory.

3.6.3 For Objective Three

The third objective is the main objective of this research. Indeed, this research aims at demonstrating the effect of external debt on economic growth. Therefore, GDP is the dependent variable whereas independent variables are external debt, labor force, gross capital formation, export and public expenditures. The starting point of the model formulation to be developed throughout this study is the idea developed by Raffinot (1991) according to which research on growth models have highlighted the importance of unexplained part of growth by traditional production factors (capital, labor). According to this author, it is difficult to make a reliable assessment of no directly unproductive expenditures (education, health) on growth. However, some countries have managed to use external funding in a productive way.

For poor countries, particularly African countries, debt is sometimes unsustainable. Loan in general is used for the development of social and economic infrastructures. However, even when external funding is not used in investments directly productive, public infrastructure, education, and health projects, have a positive impact on growth through:

a) The positive externalities created by public infrastructures;

b) The increase in the productivity of the labor factor generated by investment in the education and health sectors.

The departure point of the model formulation is the Cobb-Douglas function. In the model, apart from capital (investment) and labor as exogenous variables, external debt is taken into consideration. To these three variables net export and public expenditures can be added on basis of the model developed by Ncema and Gana (2002) in their study as cited by Ezeabasili, et al. (2011). They used empirical models to explain the impact of external debt and debt servicing on one hand, and a country's growth performance on the other hand.

The model has been presented in the equation two.

In the equation

a0 = Constant

a1 to a5 = coefficients

As said, by assumption $a1 > 0, a2 > 0, a3 > 0, a4 > 0, a5 > 0$

The linear model takes into consideration logarithms of both sides of the equation (the Cobb Douglas function requires to be transformed in logarithms). Thus, the equation can be presented as following:

$$LogGDP = a0 + a1logLF + a2logGCF + a3logEXTD + a4logPEXP + a5logEXP + \mathcal{E}t \quad (9)$$

LogGDP = Log Gross Domestic Product (GDP) at constant price

LogEXTD = Log External Debt

LogGEXP = Log of Government Expenditures

LogLF= Log of Labor Force

LogEXP=Log Export

LogGCF= Log of Gross Capital Formation

εt = Error term

Expected signs are presented in the following table:

Table 3.3.: Expected Signs and Parameters for the Econometric Model Objective three

Parameters	a1	a2	a3	a4	a5
Expected signs	+	+	+	+	+

Source: The author

Explanations on variables:

GDP is the endogeneous variable in the econometric model formulated for the sake of this study. It is the broadest measure of aggregate economic activity (Abel, et al., 2017). It is defined as an aggregate measuring production of goods and services in a country during a given period. GDP has a threefold definition (Bezbakh and Gherardi, 2000):

i) Sum of added values of agents operating on the national territory on which we add VAT and custom duties;

ii) The sum of utilization of various goods and services produced: final consumption, investments, public expenditures and exports minus imports;

iii) Sum of incomes distributed at the end of production process: salaries, interests, dividends, taxes …

Independent variables of the model are: gross capital formation, labor force, external debt, private consumption, public expenditures and exports. GDP used in this research is GDP at constant price or real GDP.

Gross Capital Formation is the purchase of capital goods used in production of

output. GCF also refers to capital accumulation. It affects the growth rate of output and labor productivity and thus helps determine the economy's long run performance (Auerbach and Kotlikoff, 1999). Investment is the second type of decision of private sector. This decision carries on acquisition of diversified goods such as machines, computers, lands, industrial and commercial buildings… The objective of investments goods is not consumption but future production of other goods and services (Burda and Wyplosz, 2003).

Government expenditures are government purchases of goods and services which include any expenditure by the government for a currently produced good or service, foreign or domestic (Abel, et al., 2017).

Exports are made up with goods and services produced within a country, that are purchased by foreigners; imports are goods and services produced abroad that are purchased by a country's residents. Net exports are positive when there are more exports than imports and negative when imports exceed exports. Exports are added to total spending because they represent spending (by foreigners) on final goods and services produced in a country. Imports are subtracted from total spending because consumption, investment, government purchases and exports are national global demand of a country (Abel, et al., 2017).

Labor force has to be added in the growth model as long as capital accumulation cannot explain by itself sustained economic growth rather we must expand the model incorporating other sources of economic growth such as population (Mankiw, 2016). External debt otherwise known as foreign debt, is the component of total debt

held by creditors of foreign countries, i.e. non-residents of the debtor country. As said previously it can have a positive impact on the economic growth when well managed and allocated to productive projects of development.

3.7 Data Analysis and Processing

In order to verify whether external debt has an effect on Rwandan economic growth, an econometric analysis was carried out on data with economic growth as indicator (quantifiable variable to measure the economic situation). In this case, the E-views software is unavoidable. However, other methods such as analytical methods have been used.

3.7.1 Data Processing

Quantitative data collected from several reports, namely reports of IMF, Index mundi, National Institute of statistics of Rwanda were sorted and analyzed with E-views software. The analyses done in this research are based on a quantitative approach.

3.7.2. Data Analysis

To reach all three objectives econometric analysis has been used. Modeling the contribution of debt to economic growth was the most important analysis conducted in this research. The model intends to verify whether external debt has contributed to economic growth of Rwanda which is the most important indicator of economic development. Its objective is to get facts in order to reach reality with regards to the effect of external debt on the economic growth of Rwanda. Two other econometric models were developed in order to analyze the effect of external debt on public investment and demonstrate the relationship between external debt and private

investment.

Indeed, econometric studies aim at analyzing facts (Waquet and Montousse, 2006). It is about making a regression analysis in order to test the relationship. According to Gujarati (2005), regression is the main tool in econometrics. Thus, the model has been tested for Rwanda. The model developed is a multiple regression model with several variables. A concept that can be measured is called a variable (Kumar, 2011). In an econometric model, the dependent variable depends on two or more explanatory variables, or regressors (Gujarati, 2005).

In this research, time series have been used for the period 1991 up to 2016. Most of macroeconomic time series data are non-stationary (mean and variance are not constant). As when dependent and independent variables in time series data are non-stationary, a non-sense regression or spurious regression model is likely to occur, the stationarity test through the unit root test is unavoidable. The R-square is high and coefficients seem to be statistically significant while they aren't. This case can mislead the economic interpretation. When series are stationary, we use the Ordinary Least Squares (OLS), but when the series are not stationary OLS cannot be used because there may be a non-sense regression or a spurious regression (Gujarati, 2005).

Hence, before coming to the regression, a stationarity test has been conducted with the unit root test, then, the estimation of the equation. The test of unit root has been done using the Augmented Dickey Fuller test. All analyses have been done in the E-views Software. As all series were not stationary at level (I0) except labor, the test

were done also at the first difference to make them stationary (I1). After this process of stationarity, next was the regression using OLS to find the long run equation and thereafter perform the cointegration test. The cointegration test has helped knowing whether series are co integrated. The reason for cointegration test is to determine whether a group of series is cointegrated or not. Different variables in the model are cointegrated if the residuals from the long run estimated model are stationary.

In a word, steps of the econometric analysis for three objectives of the research were the following:

i) Data collection from NISR and MINECOFIN

ii) Data transformation where needed

All data have been transformed into logarithm before regression in order to facilitate interpretations in terms of percentage.

iii) Time series determination

Data used for the econometric analysis were time series, that is, annual data from 1991 to 2016

iv) Stationarity test

Before the regression the unit root characteristics of the data were done. The stationarity test was done in order to allow using the Ordinary Least Square (OLS) method.

The ADF is used to verify whether there is stationarity or not. When $ADF_{cal} < ADF_{crit}$: there is no unit root. Time series are stationary. In the opposite case series are not stationary.

v) Estimation of the long run equation

It helped to calculate coefficient and probability in order to determine the long run relationship between external debt and economic growth. The same analyses were done on the relationship public investment external debt and private investment external debt. The decision rule is such as the probability calculated must be inferior to the probability critical (1%, 5% or 10%). Also, in order to conclude that there is a positive long run relationship between endogenous variable and exogenous variables, coefficients should be positive, otherwise there is a negative relationship.

vi) Cointegration test

The objective of this test was to check whether residuals from the long run estimated model are stationary. There is cointegration when ADF calculated value is less than critical value at 1%, 5% or 10%. In this case, residuals of the long run equation have no unit root.

vii) Estimation of the short run equation

Error Correction Model was performed in order to test whether there is a short run relationship among variables in the model. There is a short-term relationship in the model when probabilities of independent variables are below 1%, 5% or 10% critical values. Also, coefficients must be positive.

viii) Interpretation of results

All results were explained in order to verify whether results reached are connected to the main objective of the research, that is, to study the existence of relationship between external debt and economic growth in Rwanda. Results related to the relationship public investment-external debt and private

investment-external debt were interpreted as well.

ix) Correlogram squared residuals

This test is done in order to test auto-correlation. Non-autocorrelation assumption should be respected in the choice of the model.

The correlogram squared residuals tests whether the model contains any problem of residuals. There is autocorrelation when the error of period t influences the error of the following period t+1. There is no autocorrelation in the model when the probability calculated is greater than 1%, 5% or 10% critical value.

x) Normality test

Normality test has been performed on residuals to see if they are normally distributed through the Jacque-Bera test. When the Jacque-Bera probability is greater than critical probability (1%, 5% or 10%), the H_o is accepted i.e. residuals are normally distributed.

xi) Serial correlation

This test was performed in order to know whether there is absence of serial correlation or not. In fact, the no serial correlation is one of classical assumptions that should be verified to say that the estimation is BLUE. The H_o of absence of serial correlation is accepted when the probability of χ^2 is greater than 5 %, in the contrary case, it is rejected and the model has serial correlation.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1. Chapter overview

This chapter is an analysis of data and interpretation of results so as to verify hypotheses of the research. It provides an overview of Rwanda's external debt, that is, its background and evolution. Second it makes a relationship between external debt and public investment. The third important part of the chapter highlights the correlation between external debt and private investment. Lastly, analyses related to the effect of external debt on economic growth have been conducted as well in order to demonstrate the empirical relationship between external debt and the economic growth of Rwanda whose GDP is the indicator.

External debt looks like a double edged knife. The theoretical literature review of this thesis as well as empirical review show that external debt can be harmful to the economy, but it can also constitute a factor of development depending on its management by the lender country i.e. its allocation to productive investment projects or not. The main hypothesis of this thesis is verified in this chapter, that is, to study the relationship between external debt and economic growth.

However, as external debt acts on economic growth through public and private investments, a correlation between these two variables and external debt has been made before the econometric analysis related to the effect of external on the economic growth of Rwanda. In one word, results for objectives one, two and three are presented in this chapter. Results of the regression equation analyzed in the last sub-section of this chapter tell us more about the benefit of external debt in terms of

contribution to the economic growth. The external debt evolution has been presented in chapter two related to the literature review.

4.2. Variables Description

Three econometric models have been analyzed in this thesis. In the first model the endogenous variable is public investment while exogenous variables are lagged public investment, external debt and tax. In the second model endogenous variable is public investment while exogenous variables are lagged private investment, GDP, interest rate and external debt. The last model has established relationship between GDP as dependent variable and GCF, labor force, public expenditures and external debt as independent variables.

4.3. Analysis of the Effect of External Debt on Public investment In Rwanda

Analyzing the effect of external debt on public investment was the first objective of this research. To reach that objective, an empirical analysis has been conducted. The main purpose of the econometric analysis is to test the long run relationship between external debt and public investment considering that the external debt acts on economic growth through public investment. However, before establishing the long run relationship a stationarity test was done on variables of the model as the OLS method had been used.

4.3.1. Stationarity Test

The stationarity test is very important in modeling since macroeconomic data without the same moment cannot be included in the same model. In fact, whether a series is stationary or not, it influences the choice of the model to be adopted. When

all series are not stationary, they have to be transformed until they become stationary by differentiating them before modeling and estimating parameters associated to the stationarity component.

The rationale behind stationarity lies much on the conventional asymptotic theory for least squares method used in regression. This test is used to know the methodology to be adopted. When the series are stationary, we use the Ordinary Least Squares (OLS), but when the series are non-stationary, OLS cannot be used because there may be a non-sense regression or a spurious regression in the terminology of Granger and Newbold (Gujarati, 2005).

A non-stationary process becomes stationary by differencing it n^{th} times. A time series is said to be integrated of order d, written I (d), when after being differencing d times it becomes stationary. A series is integrated of order zero when it is stationary at level (Gujarati, 2005).

Examples: - I (0): The series are stationary at level

-I (1): The series become stationary after the first difference

The Augmented Dickey-Fuller (ADF) tests are performed to test the unit root in time series.

As said in the research methodology, the ADF tests follow these rules:

i. When $ADF_{cal} < ADF_{crit}$: There is no unit root

ii. When $ADF_{cal} > ADF_{crit}$:There is unit root

After analyses and using the e-views software, results are such as series are not stationary at level; rather they are stationary at the first difference. Results related to

the stationarity test are presented in the table 4.1.:

Table 4.1.: Stationarity test at the first difference

Variables	ADF Critical at 1%	ADF Calculated	Conclusion
LPubInv	-3.73	-5.83	Stationary
LPubInvlag	-3.73	-3.95	Stationary
LTax	-3.75	-4.21	Stationary
LExtD	-3.73	-6.38	Stationary

Source: Econometric analysis

From the results of the stationarity test at the first difference, series that were not stationary at level become stationary after the first difference, they are integrated of order one (I (1)) as all ADF calculated are inferior to ADF critical at 1% level of confidence.

4.3.2. Long run Equation Of External Debt Impact On Public Investment in Rwanda

The long run equation allows analyzing the empirical relationship between external debt and public investment. The linear model takes into consideration the logarithms of both sides of the equation. Thus, the equation can be presented as follows:

$$LPubInv = \alpha_0 + \alpha_1 LPubInv_{t-1} + \alpha_2 LExtD + \alpha_3 LT_x + \mathcal{E}it \qquad (10)$$

The model was converted into logarithm form to allow a proper interpretation of the results in terms of percentages. Coefficients and probabilities are presented in the table 4.2.:

Table 4.2.: Results for the Long Run Equation

Variables	Coefficients	Probabilities
$LPubInv_{t-1}$	0.410778	0.0015
LExtD	0.0674410	0.0001
LT_x	0.336465	0.0560

Source: Econometric Analysis

According to these results, the LT_x, LExtD and LPubInv $_{t-1}$ are statistically significant as their respective probabilities (0.0560), (0.0001), (0.0015), are less than critical value of 5% and 10% for LTx.

After the regression, results obtained as regards the long run equation are presented below:

$$LPubInv = 0.04LPubInv_{t-1} + 0.07LExtD + 0.33LT_x + 0.073 \quad (11)$$

R-squared 0.977062

R-squared is 0.977062. There is goodness of the model and the model is fitted. Independent variables i.e. lagged public investment, external debt and tax explain public investment at 97.7%.

4.3.3. Cointegration

According to Engle and Granger, different variables in the model are cointegrated if the residuals from the long run estimated model are stationary (Gujarati, 2005). The cointegration mechanism suggests the below steps:

1. Test the stationarity of all variables
2. Estimate the long run model
3. Test the stationarity of residuals

The first and the second steps have been performed previously; the remaining step is to test the stationarity of the residuals. The stationarity of the residuals was tested by E-views 7.1 and following are the results:

Table 4.3.: Results for the Cointegration Test

Test critical value	T-statistics
1% level	-3.737853
5% level	-2.991878
10% level	-2.635542

Source: Econometric analysis

The Augmented Dickey-Fuller test statistics is -4.027388. Its probability is 0.0052. The results indicate that there is cointegration as ADF value= -4.027388 is less than the test critical value (-3.737852) at 1%; there is a long run relationship in the model. Residuals of the long run equation have no unit root.

4.3.4. Causality Analysis

Granger causality test was computed to check the causal relationship between external debt and public investment. Based on findings, the researcher found that the external debt Granger causes the public investment as the probability is equal to 0.095 (9.5%) superior to critical value of 1% what allows rejecting the null hypothesis. Indeed in Rwanda external debt is mostly invested into productive public investments as recommended by the policy related to debt management in the country.

4.3.5. Stability Test

The stability test is conducted by the CUSUM test which test is based on the cumulative sum of recursive residuals. The cumulative sum is plotted with the 5%

critical lines and the parameter instability is found when the cumulative sum goes outside the area between the two critical lines. The graph below was generated by Eviews7.1:

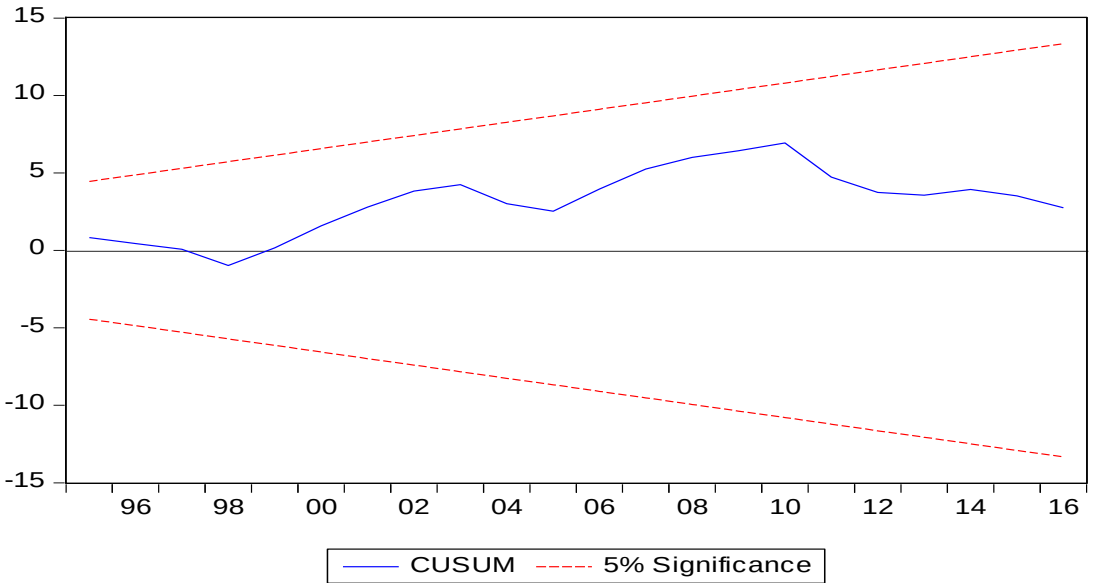

Figure 4.1: Cusum Test LPubInv-LExtD

The parameters are stable because the cumulative sum does not get outside the area of two critical lines at 5% significance. This test is very important because as the parameters are stable, the predictions are possible with the model.

4.4. Empirical Relationship between External Debt and Private Investment in Rwanda

The second objective of this research is to study the correlation between external debt and private investment. It is about studying the long run relationship between these two variables insofar as external debt impacts on economic growth because it finances public investments which create externalities for private investment. In the econometric model analyzed for objective two, private investment is the dependent

variable while external debt, lagged private investment, interest rate and GDP are independent variables. Before studying this long run relationship the stationarity test has been performed on variables.

4.4.1. Stationarity Test

Results from e-views show that series related to the model of private investment are not stationary at level. However they are stationary at the first difference. The table 4.4. presents results of the stationarity test:

Table 4.4.: Stationarity Test at The First Difference

Variables	ADF Critical at 1%	ADF Calculated	Conclusion
LPrInv	-3.73	-4.01	Stationary
LPrInvlag	-3.74	-3.95	Stationary
LIR	-3.74	-5.9	Stationary
LGDP	-3.74	-5.4	Stationary

Source: Results of the econometric analysis

Results presented in table 4.4. Show that all series are stationary after the first difference. They are integrated of order one (I (1)). ADF calculated for all series are less than ADF critical at 1% margin of error. As all series are stationary, this allows studying the long run relationship between external debt and private investment.

4.4.2. Long Run Equation related to Relationship Between External Debt and Private Investment In Rwanda

The long run equation allows analyzing the empirical relationship between external debt and private investment. The linear model takes into consideration logarithms of

both sides of the equation. Thus, the equation can be presented as follows:

$$LPrInv = a0 + a1LPrInv.t - 1 + a2LIR + a3LGDP + a4LEXTD + \mathcal{E}t \quad (12)$$

The model was converted into logarithm form to allow a proper interpretation of the results in terms of percentages. Coefficients and probabilities are presented in the table 4.5:

Table 4.5.: Results for the Long Run Equation

Variables	Coefficients	Probabilities
LPrInv $_{t-1}$	0.667080	0.0000
LPrInv $_{t-1}$	0.078537	0.0515
LGDP	0.598949	0.0515
LIR	0.001104	0.9640

Source: Econometric Analysis

According to these results, the LPrInv $_{t-1}$, LExtD, LGDP are statistically significant as their respective probabilities (0.0000), (0.0515), (0.0032) are less than critical value of 5%. However LIR is not statistically significant since its probability is more than the critical values of 10%.

After the regression results obtained as regards the long run equation are presented below:

$$LPrInv = 0.67LPrInv_{t-1} + 0.08LExtD + 0.001LIR + 0.60LGDPCP - 3.69 \quad (13)$$

R-squared 0.985683

R-squared is 0.985683. There is goodness of the model and the model is fitted.

Independent variables i.e. lagged private investment, external debt, GDP and IR explain private investment at 98.5%.

4.4.3. Cointegration

To check whether residuals from the long run estimated model are stationary, a cointegration test was led and results are presented in the table 4.6.:

Table 4.6.: Results for Cointegration Test

Test critical value	t-statistics
1% level	-3.737853
5% level	-2.991878
10% level	-2.635542

Source: Econometric Analysis

The Augmented Dickey-Fuller test statistics is -4.480610. Its probability is 0.0018. The results indicate that there is cointegration as ADF value= -4.480610 is less than test critical value (-3.737853) at 1%; there is a long run relationship in the model. Residuals of the long run equation have no unit root.

4.4.4. Causality Analysis

Granger causality test was computed to check the causal relationship between external debt and private investment. Results of analysis show that the external debt granger causes the private investment as the probability is equal to 0.0373 (3.7%) what allows to reject the null hypothesis. 3.7% is superior to 1% margin of error. Indeed in Rwanda external debt increases the productive capacity as it is well managed and directed in investment projects with multiplier effects on private investments.

4.4.5. Stability Test

Stability test is conducted by the CUSUM test which test is based on the cumulative sum of recursive residuals. The cumulative sum is plotted with the 5% critical lines and parameter instability is found when the cumulative sum goes outside the area between the two critical lines. The graph below was generated by Eviews7.1:

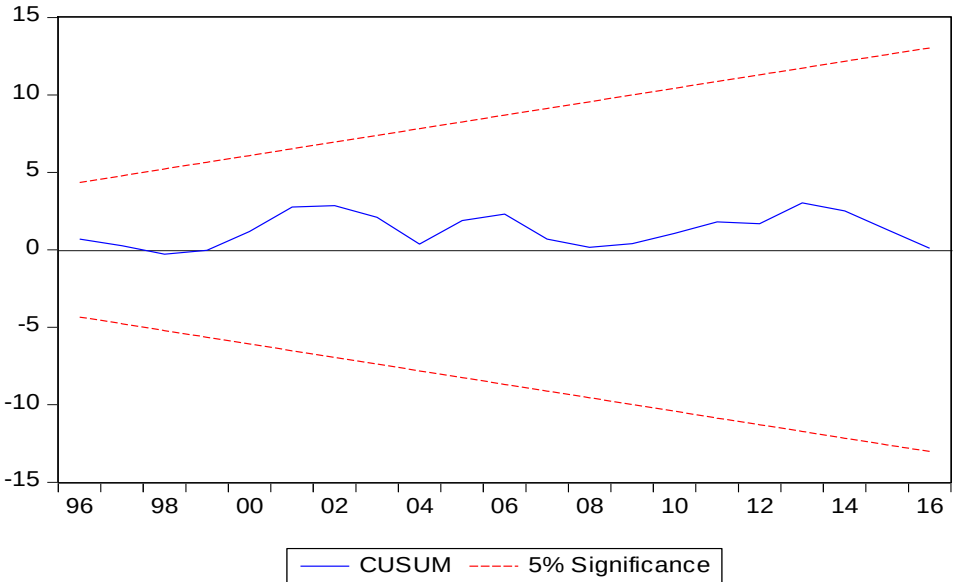

Figure 4.2.: Cusum Test LPrinv-LExtD

Parameters are stable because the cumulative sum does not get outside the area of two critical lines at 5% significance. Predictions are possible with the model because parameters are stable.

4.5. Presentation and Discussion of Results on the effect of external debt on the economic growth of Rwanda.

The Cobb Douglas equation was the departure point of the model developed in this study. Thus, GDP has been chosen as dependent variable to quantify the effect of

external debt on economic growth. Indeed, GDP is the mostly considered element to measure the economic health of a country. GDP is considered as endogenous variable in the Cobb-Douglas function.

The evolution of GDP has been presented in the chapter two. Analyses carried out in the section allow determining which factors (or indicators) have impacted the GDP, with focus on external debt. To quantify this relationship, an econometric analysis was done with aim of verifying the factors which have influenced this economic growth in Rwanda. It makes it possible to determine at which percentage external debt influences economic growth. Indeed, there is economic growth in the case GDP increases in long run. As announced in the chapter related to research methodology, the econometric method used in this research to analyze data starts by stationarity test. The stationarity test is the first test to perform on time series data to see whether they are stationary or not.

4.5.1 Stationarity Test

The following table presents the results of the stationarity test at level:

Table 4.7: Stationarity test at level

Variable	Intercept	Trend and intercept	None	Conclusion
ADF CALCULATED				
LEXDEBT	-0.370359	-2.696778	-2.696778	Non-stationary
LGCF	-0.067116	-2.487786	3.547873	Non-stationary
LGDP	-2.368961	-3.772732	4.248611	Non-stationary
LL	-4.302562	-8.167469	4.424856	Stationary

LPUBEX	0.728460	-2.859079	2.304637	Non stationary
LX	-2.996881	-1.709374	2.263532	Non stationary

Source: Econometric analysis

Taking into account the results, most series are not stationary and the researcher proceeded with the stationarity test at the first difference. Indeed, all series are not stationary at level except those related to LL. ADF calculated is superior to ADF critical for most of series taking into consideration results of stationarity test presented in the appendix three. There is unit root. Results related to the stationarity test at first difference are presented in the following table:

Table 4.8.: Stationarity test at the first difference

Variable	Intercept	Trend and intercept	None	Conclusion
ADF CALCULATED				
LEXDEBT	-6.389257	-6.288143	-6.162814	Stationary
LGCF	-6.165389	-6.157709	-4.094676	Stationary
LGDP	-6.206150	-6.069645	-4.207878	Stationary
LPUBEX	-3.351550	-3.389135	-5.086496	Stationary
LX	-6.761917	-6.654767	-1.127963	Stationary

Source: Econometric analysis

From the results of the stationarity test at the first difference, series that were not stationary at level become stationary after the first difference, they are integrated of order one (I (1)). ADF calculated is inferior to ADF critical at 1% margin of error considering results found in the appendix three. Therefore the regression has a sense.

4.5.2. Long Run Equation Of The Impact Of External Debt On Economic Growth in Rwanda

The equation nine as presented in chapter three related to the research methodology was regressed using Eviews 7.1 to assess the impact of the external debt on the economic growth in Rwanda. As the linear model takes into consideration logarithms of both sides of the equation, the equation number nine in the research methodology was considered. After regression and taking into consideration the model converted into logarithms, results are presented in the Table 4.9.

Table 4.9.: Results for the Long Run equation

Variables	Coefficients	Probabilities
LEXDEBT	0.062621	0.0011
LGCF	0.345082	0.0006
LL	0.609249	0.0297
LPUBEX	0.465396	0.0009
LX	-0.118988	0.1758
C	2.025704	0.0000

Source: Econometric Analysis

The results presented in the table above mean that:

i. If LEXTD increases of 1%, LGDP increases of 0.062621
ii. If LGCF increases of 1%, LGDP increases of 0.345082
iii. If LL increases of 1%, LGDP increases of 0.609249
iv. If LPUBEX increases of 1%, LGDP increases of 0.465396
v. If LX increases of 1%, LGDP decreases of -0.118988

The equation can be presented as follows:

LGDPCP= 0.06LEXTD + 0.35LGCF-0.12LX+ 0.61LL+0.47LPUBEX+2.03 (13)

R-squared 0.997323

Based on these results, the model is over fitted with LX (export), therefore the variable was removed from the model. Its probability (0.1758) is not significant at 1%, 5% and 10% and its coefficient is negative. A new regression was run. In Rwanda, imports are always superior to exports, thus net exports are always negative and exports cannot impact positively on GDP. Following are the results after removing exports:

Table 4.10: Results for the Long Run Equation when Exports are Excluded

Variables	Coefficients	Probabilities
LEXDEBT	0.068352	0.0004
LGCF	0.366756	0.0003
LL	0.331076	0.0688
LPUBEX	0.405821	0.0019
C	1.958355	0.0000

Source: Econometric analysis

After the regression without exports results obtained as regards the long run equation are presented in the following equation:

LGDPCP= 0.07LEXTD + 0.37LGCF+ 0.33LL+0.41LPUBEX+1.96 (14)

R-squared= 0.997059

Probability values are: 0.0004 for external debt, 0.0003 for gross capital formation, 0.0688 for labor force and 0.0019 for public expenditures. R-squared is 0.997059. There is goodness of the model and the model is fitted. It means that independent

variables (gross capital formation, labor force, external debt and public expenditures) explain the dependent variable at the level of 99.7%.

4.5.3. Cointegration

Results indicate that there is cointegration as ADF value= -3.222381 is less than test critical value (-2.660720) at 1%; there is a long run relationship in the model. Residuals of the long run equation have no unit root. Results for cointegration test are presented in the table 4.11:

Table 4.11: Results for Cointegration Test

Critical value	t-statistics
1% level	-2.660720
5% level	-1.955020
10% level	-1.609070

Source: Econometric analysis

The Augmented Dickey-Fuller test statistics is -3.222381. Its probability is 0.0024

The results indicate that there is cointegration as ADF value= -3.222381 is less than Test critical value (-2.660720) at 1%; there is a long run relationship in the model. Residuals of the long run equation have no unit root. As long as there is cointegration, the researcher proceeded with the Error Correction Model to see if there is also a short run relation among variables of the model.

4.5.4. Error Correction Model

ECM is performed to test whether there is a short run relationship among variables in the model. The results related to the ECM are presented in the table 4.12.:

Table 4.12: Results for Error Correction Model

Variables	Coefficients	Probabilities
RESIDLR1	-0.597786	0.0023
DLEXDEBT	0.029485	0.0199
DLGCF	0.427533	0.0000
DLL	0.670108	0.0042
DLPUBEX	0.345993	0.0000

Source: Econometric analysis

After the regression equation of ECM model is:

*LGDPCP =-0.60*RESIDLR1 + 0.03*LEXDEBT + 0.43*LGCF + 0.67*LL +*

*0.35*LPUBEX (15)*

R-squared= 0.958536

Probability values are 0.0023, 0.0199, 0.0000, 0.0042 and 0.0000 respectively for RESIDLR, LEXDEBT, LGCF, LL and LPUBEX.

Economic Interpretation of the ECM

The statistical significance of the Error Correction term (RESIDLR1) is that it measures the deviation of the dependent variable from its long-term trend. The error correction term represents the mechanisms of self-correcting of the system for deviations from its long run trend. From the results, the Error Correction Term is statistically significant. The relative probabilities of independent variables are less than 5%; all independent variables explain the LGDP in short run.

The results above reflect a short-term relationship in the model, because the probabilities of independent variables are below 5%. All coefficients are positive. So, in short run increase in every dependent variable entails an increase in GDP. R^2=0.958536 means that there is goodness of short run model, the model is fitted. The LGDP is explained at 95% by external debt and other identified independent variables in short run. The error correction term is also negative (RESIDLR1= -0.597) and it makes a good indicator that the correction of errors is possible. Based on the value of the error correction term, the researcher concludes that around 59.7% of all errors will be corrected in one year (one period), while 100% of errors will be corrected in one year and 8 months.

4.5.5 Diagnostic Tests

Diagnostic tests are useful to test whether the regression is meaningful. The estimators of the model should be BLUE (Best Linear Unbiased Estimator). Thus, a set of classical assumption should be verified (Gujarati, 2005). After testing the short run equation, the supplementary tests are necessary to verify these classical assumptions. The diagnostic tests performed on our regression are residual test and stability test.

I) Residual tests

These tests are performed on residuals. Residuals tests performed on the regression are the following: Normality Test, Heteroskedasticity Test, Correlogram test for autocorrelation, Serial correlation test and causality test.

a) Correlogram squared residuals

The test aims at showing whether the model contains any problem of residuals. Non-autocorrelation assumption should be respected in the choice of the model. There is autocorrelation when the error of period t influences the error of the following period t+1. The probability of errors in period t should be independent from the probability of the occurrence of errors in period t+1 (Gujarati, 2005). Below are the hypotheses of the test:

H_o: Absence of autocorrelation of errors

H_1: Presence of the autocorrelation of errors

Table 4.13: Probability of Errors

Number of lags	1	2	3	4	5	6	7	8	9	10	11	12
Probabilities	0.465	0.350	0.357	0.415	0.433	0.532	0.640	0.307	0.257	0.305	0.352	0.343

Source: Results of the regression from the software E-views

These results confirm that there is no autocorrelation in the model because up to 12^{th} lag the probability is greater than 1% critical value.

b) Normality test

Normality test is performed on residuals to see if they are normally distributed.

The two hypotheses of this test are:

Null hypothesis: H_o: The residuals are normally distributed

Alternative Hypothesis: H_1: The residuals are not normally distributed

The researcher, using the E.views7.1, performed this test of Jacque-Bera and found the following results: the probability of Jacque-Bera is equal to 0.23, greater than 1%. When the Jacque-Bera probability is greater than critical probability (1%, 5% or 10%), the Ho is accepted. The calculated probability is greater than critical probability; the Ho is accepted. The residuals are normally distributed.

c) Serial correlation

The non-serial correlation is one of classical assumptions that should be verified to say that the estimators are BLUE. The following are the hypothesis of this test:

H_o: Absence (no) of serial correlation

H_1: Presence of serial correlation

The H_o is accepted when the probability of χ^2 is greater than 0.05 (5 %), in the contrary case, it is rejected and the model has serial correlation.

The analysis ended at the following results: there is no serial correlation in the model; the probability of χ^2 (0.0742) is greater than 0.05 (5 %). The null hypothesis of the no serial correlation is accepted because the probability of χ^2 is greater than

0.05 (5%).

d) Heteroscedasticity

The heteroscedasticity test is performed to see whether the variance of residuals is constant and if the classical assumption of homoscedasticity is respected. Following are the hypothesis of the test:

H_o: No heterescedasticity (presence of homoscedasticity)

H_1: Presence of heteroscedasticity (absence of homoscedasticity)

According to results found from the Breusch-Pagan-Godfrey test, the probability of **$\chi 2$** (0.8466) is greater than 10%, so the null hypothesis of presence of homoscedasticity is accepted. There is homoscedasticity i.e., the variance of residuals of the model under consideration is constant.

e) Causality analysis

Granger causality test was computed to check the causal relationship between the external debt and the domestic production. Based on findings, the researcher found that the external debt granger causes the domestic production as the probability is equal to 0.0266 (2.7%) what allows to reject the null hypothesis. 2.7 is superior to 1% margin of error. Indeed in Rwanda external debt increases the productive capacity as it is well managed and directed in projects with multiplier effects.

II) Stability test

As said previously, stability test is conducted by the Cusum test which tests is based on the cumulative sum of recursive residuals. The cumulative sum is plotted with the 5% critical lines and parameter instability is found when the cumulative sum goes

outside the area between the two critical lines. The graph below was generated by Eviews7.1:

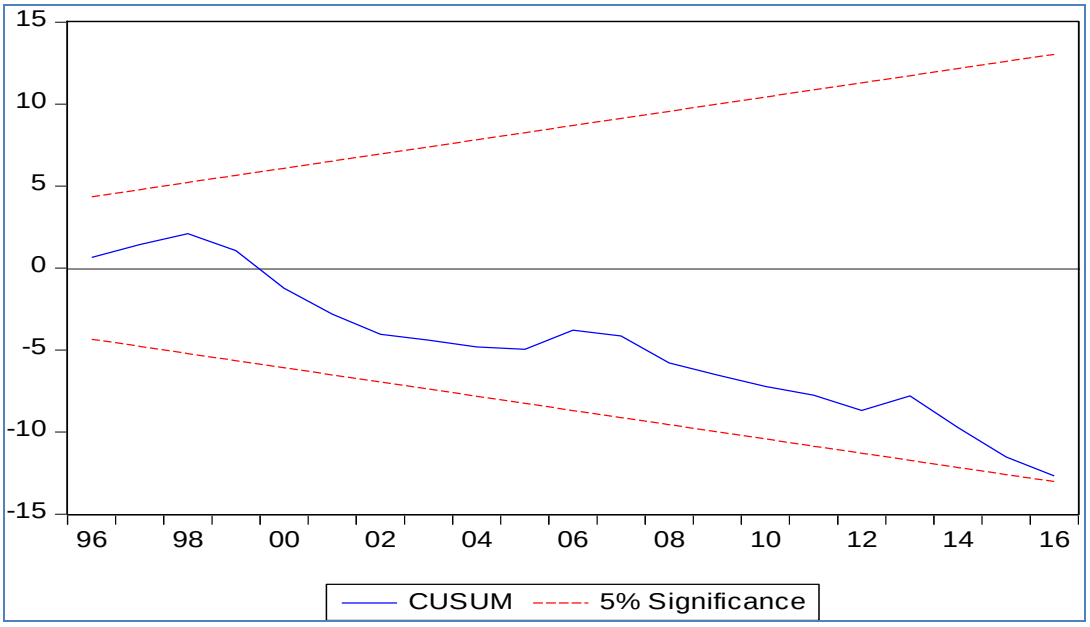

Figure 4.3: Cusum test LGPCP-LExtD

4.6 Discussion of Findings

4.6.1 Discussion of Findings Related to the Effect of External Debt on Public Investment

Based on the results of the long run model from Eviews 7.1, all variables have effect on public investment as their estimated coefficients are statistically significant at 10% level of confidence; their relative probabilities are less than 0.05 and 0.1 for LTx. Furthermore, all coefficients related to exogenous variables (lagged public investment, external debt and tax) are positively correlated to the public investment. Results above mean that when:

i. LPubInv $_{t-1}$ increases by 1%, the LPubInv increases by 0.41%;

ii. LExtD increases by 1%, the LPubInv increases by 0.07%;

iii. LT_x increases by 1%, the LPubInv increases by 0.34%.

Thus, the results of the analyses show that there is a positive correlation between external debt and public investment in Rwanda. Estimated coefficient of external debt is statistically significant at 10% level of confidence. Also, the coefficient of external debt is positive, which means that a positive correlation exists between external debt and public investment in Rwanda. The rationale is that the loan from external debt in Rwanda is mostly allocated to public infrastructures.

However one can notice that the amplitude of tax is superior to the one of external debt. An increase of 1% of external debt entails an increase of 0.08% of public investments while an increase of 1% of tax entails an increase of 0.33% of public investments. This goes to mean that tax is more useful than external debt in terms of contribution to public investment. Therefore Government should implement macroeconomic policies of stabilization likely to help it gathering more tax and contracting less external debt. Sanchez and Almada (2016) have demonstrated evidence of the relationship between public debt and public investment for the case of Mexican economy. The variable interaction between public investment and public debt is statistically significant at 0, 01. In Rwanda, the variable external debt is statistically significant at 0.01, what means that external debt contributes to public expenditures.

4.6.2 Discussion of Findings Related to the Empirical Relationship between External Debt and Private Investment

Results of the long run model end at conclusion that $LPrInv_{t-1}$, LExtD, LGDP have effect on private investment as their estimated coefficients are statistically significant at 5% margin of error; their relative probabilities are less than 0.05. Furthermore,

coefficients related to $LPrInv_{t-1}$, LExtD, LGDPCP are positively correlated to the private investment as signs related to their respective coefficients are positive. However, opposite to the theory, in Rwanda there is no correlation between interest rate and investment. It means that the interest rate does not influence private investment. Investors are mostly attracted by other factors like the profitability of investment, security, their level of income, their payback capacity…

Results above mean that when:

i) $LPrInv_{t-1}$ increases by 1%, the LPrInv increases by 0.67 %;

ii) LExtD increases by 1%, the LPrInv increases by 0.08 %;

iii) LGDPCP increases by 1%, the LPrInv increases by 0.60 %

iv) LIR increases by 1%, the LPrInv increases by 0.001 %

Thus, results of analyses show that there is a positive correlation between external debt and private investment in Rwanda. Estimated coefficient of external debt is statistically significant at 5% level of confidence. Also, the coefficient of external debt is positive, what means that a positive correlation exists between external debt and private investment in Rwanda. The rationale is that in Rwanda external debt finances public infrastructures useful for encouraging private investments. Public investment financed by debt creates positive externalities for private investments.

Coefficient of LGDPCP (0.60) is superior to the one of LExtD (0.08%). This result means that the contributive capacity of income to private investment is superior to the contributive capacity of external debt. Therefore, Rwanda should focus on macroeconomic policies aiming at increasing national income and reduce external

debt. Although Rwanda is not at high risk following its Debt Sustainability analysis, results of this research show that external debt should be the last solution because its contribution to investments is less than other traditional means to finance investments. Nevertheless, Rwanda is among HIPCs which are performing well compared to some other LDCs in which external debt have a negative effect on public investments. For instance Desphande (1997) led a research on thirty highly indebted countries from 1971 to 1992 and found a negative relationship between the level of external debt and private investment at 1% critical value.

4.6.3 Discussion of Findings Pertaining to the Effect of External Debt on the Growth of Output in Rwanda

Based on the results of the long run model from Eviews 7.1, all variables have effect on LGDP as their estimated coefficients are statistically significant at 10% level of confidence; their relative probabilities are less than 0.1. Furthermore, all coefficients related to exogenous variables (gross capital formation, labor force, external debt and public expenditures) are positively correlated to the GDP. Results above mean that when:

i. -LEXDEBT increases by 1%, the LGDPCP increases by 0.08%;
ii. LGCF increases by 1%, LGDPCP increases by 0.37%
iii. LL increases by 1%, LGDPCP increases by 0.33%
iv. LPUBEX increases by 1%, LGDPCP increases by 0.41%

Therefore, results of analyses show that there exist a positive correlation between external debt and economic growth in Rwanda. Estimated coefficient of external

debt is statistically significant at 10% margin of error. Also, the coefficient of external debt is positive; this goes to mean that a positive correlation exists between external debt and economic growth in Rwanda. The rationale is that in Rwanda loan from external debt is allocated to productive projects of investment, especially in the public sector. Examples of public investments financed by external debt are presented in the appendix four. Furthermore, as this has been highlighted in the external debt policy of Rwanda in chapter two, external borrowings are contracted in order to reach objectives planned into strategies of development and Rwanda tries to respect requirements of bilateral and multilateral lenders in order to avoid debt overhang. Indeed, it has been shown in the empirical literature review that debt overhang is among reason which block the effect of external debt on the economic growth.

Results of equation 14 show that all exogenous variables selected for the econometric analysis explain output in Rwanda. However the magnitude of external debt (0.8) is less than other variables, meaning that LGCF (0.37), LL (0.33) and LPUBEX (0.41) explain more economic growth than external debt. This goes to means that Rwanda should act more on variables like labor force, public expenditures and gross capital formation to increase its output level. Indebtedness should be limited as this has been advocated by theoricians like Laffer and Keynes.

Rwanda has made tremendous efforts in terms of debt management, what allowed it to reach objectives in terms of contribution of external debt to economic growth and compared to most LDCs if we base on results of previous studies. For instance, using the OLS method and cross section data from 1991 to 2010 on the case of eight

African countries, Ejigayehu found that there is a significant and negative relationship between debt service and economic growth. Also, according to his results, there is insignificant relationship between external debt and economic growth.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

The last chapter of this thesis on the effect of external debt on the economic growth of Rwanda presents main results of the research on the subject under study. Besides some recommendations are formulated in light of the findings reflected at the end of this study in connection with the Government of Rwanda and other stakeholders involved in the indebtedness process, such as bilateral and multilateral borrowers. The summary of findings links the results found to the specific objectives of the study. It includes findings on correlation between external and variables such as public investment, private investment and economic growth. Recommendations to the Government of Rwanda have been formulated. Policy implications are presented to show how the research findings can be useful to the Government of Rwanda.

5.2. Summary of Findings

5.2.1. Summary of Findings about the Effect of External Debt on Public Investment

This thesis aimed primarily at analyzing the empirical relationship between external debt and public investment. This first objective of this research was reached through verifying the empirical relationship between external debt and public investment. In the first equation of the research, endogenous variable was public investment while exogenous variables were lagged public investment, external debt and tax.

Analyses done came up with results that estimated coefficients are statistically significant at 5% level of confidence. The relative probabilities for LExtD and

LPubInv $_{t-1}$ are less than 0. 05. For LTx the relative probability is less than 0.1. Also, it has been demonstrated that is long term, all coefficients are positive. In Rwanda, an increase of lagged public investment of 1% ends at an increase of public investment of 0.410778%; an increase of external debt of 1% ends at an increase of public investment of 0.08% while an increase of tax of 1% ends at an increase of public investment of 034%. Therefore, all exogenous variables have a positive effect on endogenous variables. R-squared is 0.977062. This means that lagged public investment, external debt and tax explain public investment at 97.7%. These results allow confirming the first hypothesis of this research.

However results show that the amplitude of tax is superior to the one of external debt. This goes to mean that tax is more useful than external debt in terms of contribution to public investment. Therefore Government should implement macroeconomic policies of stabilization likely to help it gathering more tax and contracting less external debt.

5.2.2. Summary of Findings Pertaining to the Effect of External Debt on Private Investment

The second objective of this thesis was met. It aimed at verifying whether there is a positive correlation between external debt and private investment. The second equation formulated had as endogenous variable the private investment while the exogenous variables were lagged private investment, interest rate, external debt and GDP. All exogenous variables are statistically significant except interest rate whose probability is more than the critical values of 10%. Lagged private investment, external debt and GDP have an effect on private investment as their estimated

coefficients are statistically significant at 5% level of confidence.

Moreover, the results from the econometric analysis show that an increase of 1% of lagged private investment, external debt and GDP entails an increase of 0.667080 %, 0.078537 %, and 0.598949 of private investment respectively. These results show clearly that external debt positively impacts on private investment. Hence, the second hypothesis of this research is verified and confirmed. However, the economic theory states that there is a negative relationship between interest rate and private investment. Results of this research have demonstrated the opposite for the case of Rwanda as its level of investment depends mostly on needs in terms of funding and expected profits from projects to be financed.

Nevertheless, although Rwanda is not at high risk following its Debt Sustainability analysis, results of this research show that external debt should be the last solution because its contribution to investments is less than other traditional means to finance investments. The coefficient of LGDPCP (0.60) is superior to the one of LExtD (0.08%).

5.2.3. Summary of Finding about the Effect of External Debt on Economic Growth

Economic growth means increase of production in the long term. That is why, GDP and GNP are the indicators used to measure economic growth. In a country, when GDP increases, there is economic growth. Therefore, GDP is the main indicator used by international institutions to know and determine a country's economic health and condition. In macroeconomics, the Cobb-Douglas function is the departure point of

the analyses aiming at demonstrating determinants of economic growth. This is why studying the relationship between GDP and external debt was among the main concerns. It has been noticed that Rwanda's GDP increased in average during the period of study.

The research has provided an answer to the question regarding the effect of external debt on the economic growth of Rwanda. Based on the results of the long run model, all exogenous variables identified in the model have an effect on the LGDP as their estimated coefficients are statistically significant at 10% level of confidence; their relative probabilities are below 0.1. Furthermore, all coefficients related to exogenous variables (gross capital formation, labor force, external debt and public expenditures) are positively correlated to the GDP. Independent variables selected among which the external debt explain dependent variable, that is, GDP at the level of 99.7%, R-squared is 0.997059.

Therefore, the research has confidently established a positive correlation between external debt and economic growth in Rwanda. Estimated coefficient of external debt is statistically significant at 10% margin of error. Also, the coefficient of external debt is positive, what means that a positive correlation exists between external debt and economic growth in Rwanda. These results allow to verify and confirm the third hypothesis of the study. While in some other Least Developing Countries, external debt is a threat as one can notice it in the empirical literature review of this study, for Rwanda it has been an opportunity for economic growth and economic development. The rationale is that in Rwanda loan from external debt is allocated to productive investment projects, especially in the public sector. External

borrowings are contracted in order to achieve objectives expected from development strategies while Rwanda has been trying to abide by the requirements from bilateral and multilateral lenders to avoid debt overhang and debt crowding out.

However, Rwanda should act more on variables like labor force, public expenditures and gross capital formation to increase its output level and limit resort to indebtedness because according to results of this research the magnitude of external debt (0.8) is less than other variables, meaning that LGCF (0.37), LL (0.33) and LPUBEX (0.41) explain more economic growth than external debt.,

5.3. Conclusion

The results of this thesis show that external debt is part of the determinants of Rwanda's economic growth. Proper management of external debt at both national and international levels has helped Rwanda making external debt profitable. Moreover, the existence of development strategies notably EDPRS has been a trump for the success of external debt policy in terms of its contribution to the economic growth. This investigation on the case of Rwanda, has allowed conclude that the allocation of external debt to specific development projects in line with development strategies, has positively contributed to economic growth. Indeed, the research has established a positive correlation between external debt and public investment.

This conclusion matches with Keynes view which was presented in the literature review and according to which a public deficit honestly financed by debt stimulates production. Keynes argues that the weight of public debt is from somewhere else. It can be found in the inefficiency of public management, bad allowance of public

resources, eviction effect, transformation of saving in current expenditures reducing capital accumulation and stopping economic growth.

In the case of Rwanda, external debt does not create an eviction effect because the results show that there is a positive relationship between external debt and public as well as private investment. External debt is used to finance public investment, which creates a positive external effect on private investment what explains the positive correlation between external debt and economic growth in Rwanda.

5.4. Recommendations and Policy Implications

5.4.1. Recommendations

Based on findings from this study the following recommendations are made:

i. Tough measures should be taken on both sides to make debt beneficial to all stakeholders in the indebtedness process;
ii. Lenders should grant credits to countries based on programs and projects geared towards development projects;
iii. The Government of Rwanda should implement a kind of macroeconomic policy likely to help improve macroeconomic indicators in order to collect more taxes because, although external debt has a positive effect, in the long term it may become a threat for the Rwandan economy;
iv. The Government of Rwanda should reduce current expenditures in order to devote part of its budget to expenditures on infrastructures. There is need to apply the principle of opportunity cost in the management of public resources;
v. The Government of Rwanda should encourage external private guaranteed

debt to boost the private sector as one of its economic pillars.

5.4.2. Policy Implications

This study has revealed to us that external debt is a determinant indicator in development of Rwanda since it contributes to the economic growth. However it may entail negative effects when it comes to facing the debt service including other side effects pertaining to balance of payment, money depreciation and inflation. Therefore, without stopping resort to external debt, the country must take into consideration its capacity to pay back as well as other negative consequences listed above. There is a need of taking into consideration the Laffer curve hypothesis in the management of public external debt. Moreover, tough measures in terms of macroeconomic policies of stabilization should be taken in order to collect more taxes and reduce the external financial dependency.

5.4.3. Areas for Further Studies

This study was restricted to external debt. In front of budget deficit, a State may choose either internal or external debt, or banknote plate. I would like to suggest future researchers to study the relative effectiveness of external and internal debt. This might pave the way for making a comparison of relative effectiveness of external debt and internal debt on economic growth. Another interesting research is to lead a comparative study of external debt effectiveness in a region like the East African Community in view of the regional integration.

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APPENDICES

Appendix 1: Results of regression objective one

Stationarity test

LPUBINV

Null Hypothesis: D(LPUBINV) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-5.835908	0.0001
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

LPUBINVLAG

Null Hypothesis: D(LPUBINVILAG) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-3.952552	0.0061
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

LTAX

Null Hypothesis: D(LTAX) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.208676	0.0036
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

LEXDT

Null Hypothesis: D(LEXTD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-6.389257	0.0000
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Long run equation

Dependent Variable: LPUBINV
Method: Least Squares
Date: 11/25/18 Time: 18:43
Sample: 1991 2016
Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPUBINVLAG	0.410778	0.113754	3.611119	0.0015
LTAX	0.336465	0.072980	4.610349	0.0001
LEXTD	0.067441	0.033433	2.017193	0.0560
C	0.731236	0.218866	3.341027	0.0030
R-squared	0.977062	Mean dependent var		4.608551

Cointegration test

Null Hypothesis: RESIDPUBLIC has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

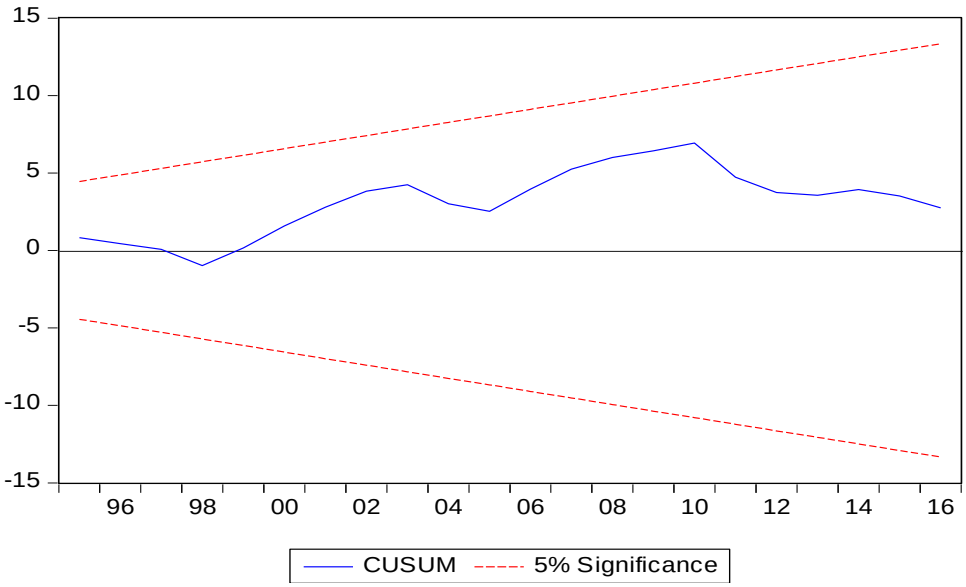
		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.027388	0.0052
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Causality test

Pairwise Granger Causality Tests
Date: 11/26/18 Time: 19:12
Sample: 1991 2016
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
LPUBINV does not Granger Cause LEXTD	22	0.82556	0.5320
LEXTD does not Granger Cause LPUBINV		2.49174	0.0945

Stability test



Appendix 2: Results of Regression Objective Two

Stationarity test

IR

Null Hypothesis: IR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-5.976146	0.0001
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

LGDPCP

Null Hypothesis: D(LGDPCP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-5.395609	0.0002
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

LPRINV

Null Hypothesis: D(LPRINV) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.005250	0.0054
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

LPRINVLAG

Null Hypothesis: D(LPRIVILAG) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-3.952552	0.0061
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Long run model

Estimation Command:
==========
LS LPRINV LPRIVILAG LGDPCP IR LEXTD C

Estimation Equation:
==========
LPRINV = C(1)*LPRIVILAG + C(2)*LGDPCP + C(3)*IR + C(4)*LEXTD + C(5)

Substituted Coefficients:
==========
LPRINV = 0.667079578932*LPRIVILAG + 0.598948856445*LGDPCP + 0.00110430236123*IR + 0.0785372305631*LEXTD - 3.6927287199

Dependent Variable: LPRINV
Method: Least Squares
Date: 11/25/18 Time: 19:11
Sample: 1991 2016
Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPRIVILAG	0.667080	0.092434	7.216799	0.0000
LGDPCP	0.598949	0.180151	3.324701	0.0032
IR	0.001104	0.024149	0.045729	0.9640
LEXTD	0.078537	0.038036	2.064813	0.0515
C	-3.692729	1.142152	-3.233132	0.0040
R-squared	0.985683	Mean dependent var		4.162934

Cointegration test

Null Hypothesis: RESIDPRIVATE has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

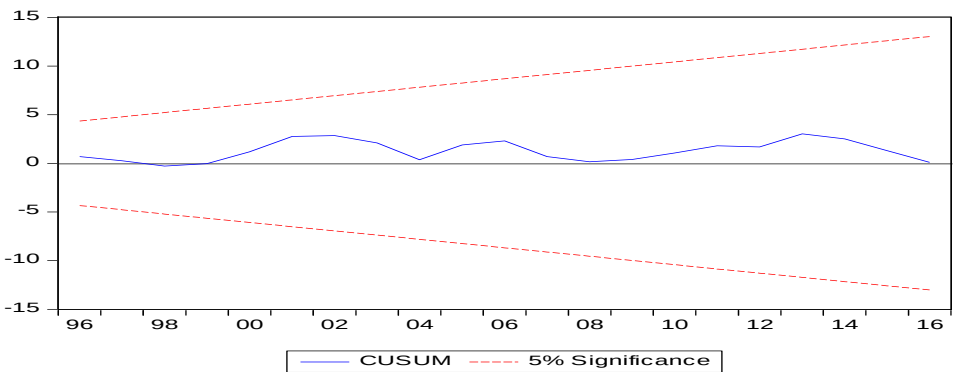
		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.480610	0.0018
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Causality test

Pairwise Granger Causality Tests
Date: 11/26/18 Time: 19:17
Sample: 1991 2016
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LPRINV does not Granger Cause LEXTD	25	0.74329	0.3979
LEXTD does not Granger Cause LPRINV		4.91394	0.0373

Stability test



Appendix 3: Results of regression objective three

1. **STATIONARITY TEST**

Stationarity at level

GDP

Intercept at level

Null Hypothesis: LGDP has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-2.368961	0.1613
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

Intercept and trend at level

Null Hypothesis: LGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-3.772732	0.0373
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

None at level

Null Hypothesis: LGDP has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.

Augmented Dickey-Fuller test statistic		4.248611	0.9999
Test critical values:	1% level	-2.674290	
	5% level	-1.957204	
	10% level	-1.608175	

EXTD

Intercept at level

Null Hypothesis: EXTD has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-0.370359	0.9000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

Intercept and trend at level

Null Hypothesis: LEXTD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-2.696778	0.2459
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

None at level

Null Hypothesis: LEXTD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-2.696778	0.2459
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	

	10% level	-3.238054

LABOR

Intercept at level

Null Hypothesis: LL has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.302562	0.0033
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

Intercept and trend at level

Null Hypothesis: LL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-8.167469	0.0000
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

None at level

Null Hypothesis: LL has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		4.424856	1.0000
Test critical values:	1% level	-2.669359	
	5% level	-1.956406	
	10% level	-1.608495	

GCF

Intercept at level

Null Hypothesis: LGCF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-0.067116	0.9429
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

Intercept and trend at level

Null Hypothesis: LGCF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-2.487786	0.3302
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

None at level

Null Hypothesis: LGCF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		3.547873	0.9997
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

PUBEX

Intercept at level

Null Hypothesis: PUBEX has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		0.728460	0.9902
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Intercept and trend at level

Null Hypothesis: LPUBEX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-2.859079	0.1940
Test critical values:	1% level	-4.467895	
	5% level	-3.644963	
	10% level	-3.261452	

None at level

Null Hypothesis: LPUBEX has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.304637	0.9931
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

EXPORT

Intercept at level

Null Hypothesis: LX has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-2.996881	0.0515
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Intercept and trend at level

Null Hypothesis: LX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-1.709374	0.7108
Test critical values:	1% level	-4.467895	
	5% level	-3.644963	
	10% level	-3.261452	

None at level

Null Hypothesis: LX has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		2.263532	0.9923
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

Stationarity at first difference

LABOR

Intercept at first difference

Null Hypothesis: LL has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.302562	0.0033
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

Trend and intercept at first difference

Null Hypothesis: LL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-8.167469	0.0000
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

None at first difference

Null Hypothesis: LL has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		4.424856	1.0000
Test critical values:	1% level	-2.669359	
	5% level	-1.956406	
	10% level	-1.608495	

PUBEX

Intercept at first difference

Null Hypothesis: D(LPUBEX) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-3.351550	0.0259
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

Intercept and trend at first difference

Null Hypothesis: D(PUBEX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-3.389135	0.0775
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

None at the first difference (10 lag)

Null Hypothesis: D(LPUBEX) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-5.086496	0.0000
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

External debt

Intercept at first difference

Null Hypothesis: D(LEXTD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-6.389257	0.0000
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Intercept and trend at first difference

Null Hypothesis: D(LEXTD) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-6.288143	0.0002
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

None at first difference

Null Hypothesis: D(LEXTD) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-6.162814	0.0000
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

LGDP

Intercept at level

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-6.206150	0.0000
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Intercept and trend at level

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-6.069645	0.0003
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

None at first difference

Null Hypothesis: D(LGDP) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-4.207878	0.0002
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

GCF or FC

Null Hypothesis: D(LGCF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-6.165389	0.0000
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Intercept and trend at first difference

Null Hypothesis: D(LGCF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-6.157709	0.0002
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

None at first difference

Null Hypothesis: D(LGCF) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.094676	0.0002
Test critical values:	1% level	-2.664853	
	5% level	-1.955681	
	10% level	-1.608793	

Export

Intercept at first difference

Null Hypothesis: D(LX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-6.761917	0.0000
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

Intercept and trend at first difference

Null Hypothesis: D(LX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-6.654767	0.0001
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

None at first difference (5lag)

Null Hypothesis: D(LX) has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-1.127963	0.2271
Test critical values:	1% level	-2.679735	
	5% level	-1.958088	
	10% level	-1.607830	

2. LONG RUN EQUATION

Dependent Variable: LGDP
Method: Least Squares
Date: 01/03/19 Time: 11:46
Sample: 1991 2016
Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.958355	0.081632	23.99018	0.0000
LEXTD	0.068352	0.016293	4.195089	0.0004
LGCF	0.366756	0.085342	4.297500	0.0003
LPUBEX	0.405821	0.114615	3.540745	0.0019
LL	0.331076	0.172601	1.918157	0.0688
R-squared	0.997059	Mean dependent var		7.090112

3. CAUSALITY TEST

Pairwise Granger Causality Tests
Date: 05/08/18 Time: 19:03
Sample: 1991 2016
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
LEXDT does not Granger Cause LGDPCP	23	4.00022	0.0266
LGDPCP does not Granger Cause LEXDT		1.42019	0.2736

4. COINTEGRATION TEST

Null Hypothesis: RESIDLR has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.222381	0.0024
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

5. ERROR CORRECTION MODEL

Dependent Variable: DLGDPCP
Method: Least Squares
Date: 01/13/18 Time: 17:18
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESIDLR1	-0.597786	0.171351	-3.488659	0.0023
DLEXDEBT	0.029485	0.011653	2.530186	0.0199
DLGCF	0.427533	0.074938	5.705145	0.0000
DLL	0.670108	0.207526	3.229036	0.0042
DLPUBEX	0.345993	0.063299	5.466008	0.0000
R-squared	0.958536	Mean dependent var		0.136339

Estimation Command:
==========
LS DLGDPCP RESIDLR1 DLEXDEBT DLGCF DLL DLPUBEX

Estimation Equation:
==========
DLGDPCP = C(1)*RESIDLR1 + C(2)*DLEXDEBT + C(3)*DLGCF + C(4)*DLL + C(5)*DLPUBEX

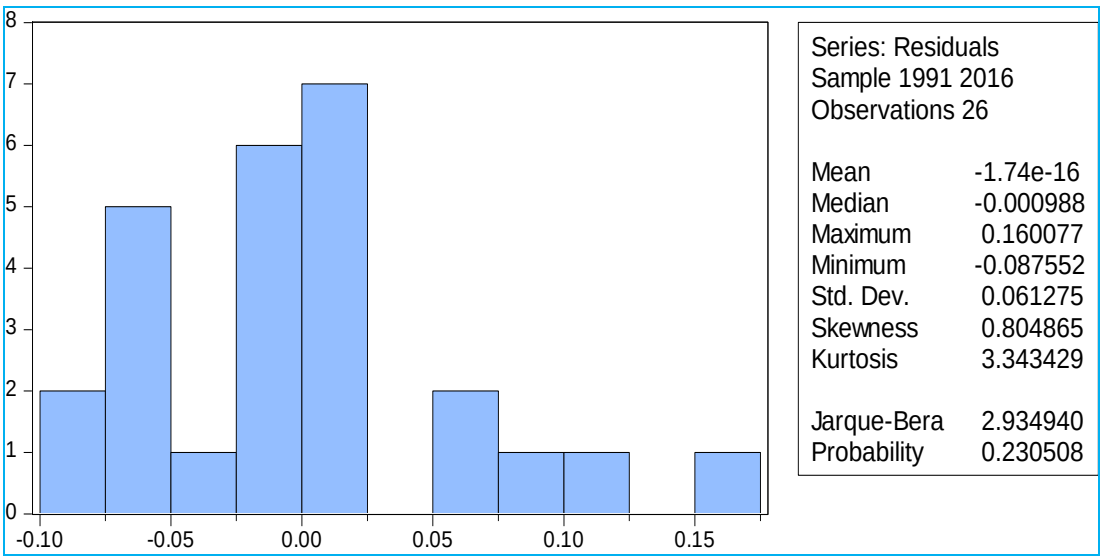
Substituted Coefficients:
==========
DLGDPCP = -0.59778598113*RESIDLR1 + 0.0294854857245*DLEXDEBT + 0.427533188319*DLGCF + 0.67010821533*DLL + 0.345993469472*DLPUBEX

6. CORRELOGRAM SQUARED RESIDUALS

Date: 01/13/18 Time: 18:07
Sample: 1991 2016
Included observations: 26

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |* . |	. |* . |	1	0.135	0.135	0.5344	0.465
.**| . |	.**| . |	2	-0.227	-0.250	2.1016	0.350
. *| . |	. *| . |	3	-0.189	-0.127	3.2333	0.357
. *| . |	. *| . |	4	-0.145	-0.170	3.9311	0.415
. *| . |	.**| . |	5	-0.164	-0.225	4.8615	0.433
. *| . |	. *| . |	6	-0.080	-0.170	5.0918	0.532
. | . |	. *| . |	7	0.043	-0.118	5.1613	0.640
. |**. |	. |* . |	8	0.325	0.202	9.4339	0.307
. |* . |	. |* . |	9	0.208	0.081	11.279	0.257
. *| . |	. | . |	10	-0.097	-0.052	11.707	0.305
. *| . |	. | . |	11	-0.096	0.053	12.154	0.352
. *| . |	. *| . |	12	-0.153	-0.104	13.370	0.343

7. Normality test



8. SERIAL CORRELATION TEST

Breusch-Godfrey Serial Correlation LM Test:

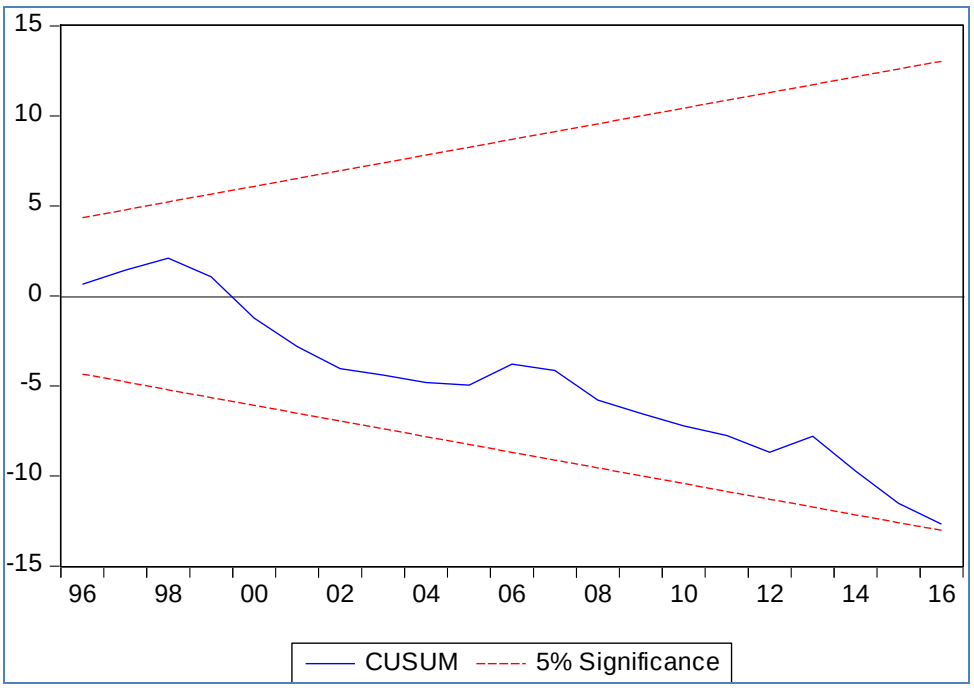
F-statistic	2.375951	Prob. F(2,19)	0.1200
Obs*R-squared	5.201665	Prob. Chi-Square(2)	0.0742

9. HETEROSCEDASTICITY

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.295592	Prob. F(4,21)	0.8775
Obs*R-squared	1.385857	Prob. Chi-Square(4)	0.8466
Scaled explained SS	1.059333	Prob. Chi-Square(4)	0.9007

9. CUSUM TEST



Appendix four: Example of projects funded by external debt in Rwanda

1. **Roads funded by external debt from 2002 to 2016**

Year	Loan	Currency	Creditor	Project
2012	740	CNY	EXIM CHINA	Road Mwityazo-Ruvumbu-Kibuye
2016	488	CNY	EXIM CHINA	Kigali Urban Road Up Grading II
2009	204.8	CNY	EXIM CHINA	Kigali Urban Road Up Grading I
2015	4.5	KWD	FKWD	Base – Nyagatare road
2007	3	KWD	FKWD	Route Gitarama – Mukamira II
2012	4	KWD	FKWD	Rubengera – Gasiza Road Project
2015	56.3	SAR	FSD	Base – Nyagatare Road
2012	48.8	SAR	FSD	Rubengera – Gasiza road project
2014	52.5	SAR	FSD	Huye – Kitaba Road project
2011	19	SAR	FSD	Kitabi – Congo Nil Road
2006	48.8	SAR	FSD	Route Kicukiro – Nyamata – Nemba
2016	6.89	JPY	JICA	Rusumo – Kayonza Road improvement
2014	74.5	US $	BAD	Route base – Gicumbi
2010	10	US $	BADEA	Rehabilitation Rutare – Ntendezi Road
2011	11	USD	BADEA	Rusizi – Gisenyi Road
2002	7.5	USD	BADEA	Route Kicukiro Nyamata – Nemba
2013	10	USD	BADEA	Rehabilitation of Huye – Kitabi road
2004	2	USD	BADEA	Rehabilitation Route Gitarama – Mukamira
2006	0.9	USD	BADEA	Route Gitarama – Mukamira
2015	15	USD	BADEA	Base – Nyagatare Road
2016	66.6	UC	FAD	Kagitumba – Kayonza – Rusumo Road
2005	14.7	UC	FAD	Route Gitarama - Ngororero – Mukamira
2012	40.5	UC	FAD	Multinational Road Rwanda – Bur
2005	14.7	UC	FAD	Route Gitarama – Ngororero – m
2003	13.5	UC	FAT	Projet d'infrastructure routier
2005	10	USD	OPEC	Gitarama – Ngororero Road
2010	10	USD	OPEC	Kitabi crete Congo Nil Road
2014	12	USD	OPEC	Huye – Kitabi Road Rehabilitation
2015	15	USD	OPEC	Base - Nyagatare Road
2002	6.5	USD	OPEC	Route Kicukiro – Nyamata – Nemba
2007	10	USD	OPEC	Route Rubengera – Gasiza

Source: MINECOFIN, Annual report, 2017

2. **Electrification projects funded by external debt**

Year	Loan	Currency	Creditor	Project
2007	20	USD	EXIMINDIA	Nyabarongo Power Project
2010	60	USD	EXIMINDIA	Nyabarongo Power Project II
2011	45	SAR	FSD	Increasing access to electricity
2014	11.2	USD	BADEA	Rural electricity Burera and Nyagatare
2002	5	USD	BADEA	Rehabilitation 3 centrales Hydro electric
2016	17.5	UC	FAD	Centrale Hydro Electr Rusiz III
2013	15.5	UC	FAD	Scaling energy access Project
2014	18.9	UC	FAD	Rusumo falls hydropower
2003	11	UC	FAD	AEP program and electrification
2015	67.7	SDR	IDA	Electricity sector strengthening
2013	37.8	SDR	IDA	Rusumo falls hydroelectricity
2013	39	SDR	IDA	Electricity access scale-up II
2010	45.1	SDR	IDA	Electricity access scale up
2005	7.5	EURO	NDF	Urgent electricity rehabilitation
2009	9.9	USD	OPEC	Electricity access scale-up II
2003	2.8	USD	OPEC	Three hydropower station rehabilitation
2013	12	USD	OPEC	Electricity access scale-up II

Source: MINECOFIN, Annual report, 2017