PUBLIC FOREIGN DEBT, SAVINGS AND INVESTMENT IN ETHIOPIA: EMPIRICAL ANALYSIS

MSc THESIS

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PUBLIC FOREIGN DEBT, SAVINGS AND INVESTMENT IN ETHIOPIA: EMPIRICAL ANALYSIS

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DECLARATION

I hereby declare that this MSc Thesis is my original work and has not been presented for a degree in any other university, and all sources of material used for this thesis have been duly acknowledged.

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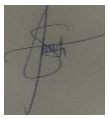
This is to certify that the thesis entitled "Public Foreign Debt, Savings and Investment in Ethiopia: Empirical Analysis**"** submitted in partial fulfillment of the requirements for the degree of **Master's** with specialization in **Development Economics** the Graduate Program of the **Department Economics,** and has been carried out by Dawit Abera **(**Id. No GSE/047/10), under our supervision. Therefore, we recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the department.



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As members of the Board of Examiners of the final Master's degree open defense, we certify that we have read and evaluated the thesis prepared by Dawit Abera under the title **"**Public Foreign Debt, Savings and Investment in Ethiopia: Empirical Analysis**"** and recommend that it be accepted as fulfilling the thesis requirement for the degree of **Master of Science in Economics** with **Specialization in Development Economics.**

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ACRONMY AND ABBREVIATION

ADF	Augmented Dicky Fuller
AfDB	African Development Bank
AFDF	African Development Fund
AIC	Akaike Information Criteria
ARDL	Autoregressive Distributed Lag
BADEA	Arab Bank for Economic Development in Africa
BOP	Balance of Payment
DF	Dicky Fuller
EIB	European Investment Bank
ETB	Ethiopian Birr
FDI	Foreign Direct Investment
GCF	Gross Capital Formation
GDP	Gross Domestic Product
GNP	Gross National Product
GTP	Gross Transformational Plan
HIPCs	Heavily Indebted poor countries
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
LDCs	Least developed Countries
LICs	Low-income countries
MDGs	Millennium Development Goals
MFDMD	Ministry of Finance Debt Management Directorate
MoF	Ministry of Finance

NBE	National Bank of Ethiopia
NDF	Nordic Development Fund
OFID	OPEC Fund for International Development
OLS	Ordinary Least Square
OPEC	Organization of the Petroleum Exporting Countries
SSA	Sub Saharan Africa
UK	United Kingdom
UN	United Nation
WB	World Bank

ABSTRACT

This study evaluates the effects of public foreign debt on savings and investment in Ethiopia. the study used an Auto Regressive Distributed Lag (ARDL) model to analyze Ethiopian data from 1979/80 to 2018/19 with national saving as a function of interest rate for bank deposit, real GDP, public foreign debt, public foreign debt servicing and investment as a function of lending interest rate, growth rate of real GDP, public foreign debt and public foreign debt servicing. First examine the stationarity of the variables using Augmented Dickey Fuller test. The result of stationarity tests reported a mixed integration at both I (0) and I (1) hence warranting the use of ARDL model. The empirical result reveals that public foreign debt has a significant positive effect in the long- run for savings. In addition, public foreign debt has positive and significant effect on investment both long run and short run in Ethiopia. Therefore, there is no "debt overhang" effect in Ethiopia. Also real GDP has positive and significant effect on savings and growth rate of real GDP has positive and significant effect on investments in the country. The Granger causality test showed that there is a unidirectional causal relationship from public foreign debt to national savings and there is no causal relationship between public foreign debt and investment. Finally, the study recommends that governance mechanism for the use and monitoring of funds generated through external borrowing needs much ardent improvement because of its strong and significant effect on savings and investment.

Key words: Public foreign debt, Public foreign debt servicing, savings and investment, ARDL model, Ethiopia

Table of contents

List of Figures

List of Tables

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Foreign debt[1]is an obligation that a debtor owes to a creditor. World Bank defines foreign debt as a debt that a country owes non-residents repayable in foreign currency, goods or services. The accumulation of foreign 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 capitals are needed to augment domestic resources. Prior to the early 1970s, the external debt of developing countries was relatively small and primarily an official phenomenon, the majority of creditors being foreign governments and international financial institutions such as the IMF, the World Bank, and regional development banks. Most loans were on concessional[2] (low-interest) terms and were extended for purposes of implementing development projects and expanding imports of capital goods. However, during the late 1970s and early 1980s, commercial banks began playing a large role in international lending by recycling surplus Organization of the Petroleum Exporting Countries (OPEC) "petrodollars" and issuing general-purpose loans to developing countries to provide balance of payments support and expansion of export sectors (Todaro and Smith, 2015).

In many developing countries, development finance involves foreign borrowing to economic development projects. Due to this, it is the major concern of highly indebted poor countries [3](HIPCs) and affected their economic fundamentals since 1970s (AfDB, 2010). However, currently it took the global attention because of 2008 global financial crisis and become a well-discussed issue (Lau, et al., 2016). In 2004, the total public debt (in which external debt has very high share) to GDP ratio of Ethiopia was around 106.7 percent which was more than average Sub-Saharan, middle income and low-income countries. At this time, Ethiopia was considered as highly indebted poor countries (Hassan, et al., 2014).

[1] The terms foreign debt or external debt or foreign borrowing or external borrowing have the same meaning and synonymous in this paper.

[2] Concessional debt is defined as debt with very low or zero interest rate ;long term maturity period and a grant element(World Bank,2017)

[3] HIPCs are group of 41 developing countries classified as being heavily indebted poor countries.

External debt is a powerful tool if it is used prudently in investment or development of a country. It can enhance investment levels and increase growth rate in the economy, if the debt servicing cost is low from the returns of the investment. Developments studies suggesting developing countries external assets can fill the savings investment gap and it boost their growth (Farhana Yeasmin and Murshed Chowdhury, 2014).

Public foreign debt is defined as the sum of government and government-guaranteed foreign debt. The central government foreign debt refers to all external loans contracted between foreign creditors and Ministry of Finance while the government guaranteed foreign debt comprises of loans and suppliers credits contracted by public enterprises, mainly the Ethiopian Electric Power, Ethiopian Electric Utility, Ethiopian Sugar Corporation, Ethiopians Railways Corporation, Ethiopian Shipping Lines and guaranteed by Ministry of Finance as well as the state owned bank , the commercial bank of Ethiopia(MFDMD ,2019).

In this study, the author's main interest is empirically analyzing the causal relationships of public foreign debt with savings and investment efforts in Ethiopia. National savings are defined as domestic savings plus net factor income from abroad. In Ethiopia, it is known that both domestic savings and net factor income from abroad are the main sources of capital accumulation for investment purposes. As of theoretical viewpoint, total savings of households, entrepreneurs and corporate unit in an economy has positive correlation with per capita income. In most of the time, it is known that saving is the main source of capital investment. Higher level of national saving can leads to higher investment and hence higher growth (Krieckhaus, 2002)

The main cost associated with the accumulation of a large external debt is debt service. Debt servicing is the payment of amortization[4] (liquidation of the principal) and accumulated interest; it is a contractually fixed charge on domestic real income and savings (Todaro and Smith, 2015). Foreign debt servicing has a negative relationships' with national savings meaning that the increase in Foreign debt servicing is likely to reduce saving through its adverse effects on net factor income from abroad (Chaudhry et al, 2009).

[4] The repayment of principal of a loan spread out over a period of time.

Domestic savings are a fundamental source for investment. Developing country like Ethiopia is characterized with low level of income and low level of domestic savings. These low levels of domestic savings are not sufficient to finance the planned investment expenditure i.e. low level of domestic savings will result low level of investment and low level of productivity, therefore foreign borrowing is necessary to finance this gap (Ali et al, 2014). As stated by Easterly (1999), domestic saving is a necessary but not a sufficient condition for raising investment in developing countries to a desired level. When external borrowing is utilized effectively, for expenditures, which are, growth related, accelerated pace of economic growth will be realized. It provides foreign capital for industrial development, managerial know how for internal institutions, advanced domestic technology, internal technical expertise acquiring knowledge from external markets and mobilization of a nation's human and material resources from access to foreign markets (Reinhart and Rogoff, 2012). As argued by Chenery and Strout (1966), foreign debt was mostly used to finance investment projects in countries with low savings rates like Ethiopia.

Foreign debt by itself is not a problem using properly for savings and investment but it becomes a problem when the foreign borrowing is unrelated to productive investment and is not used for investment purposes (UN, 2015).

According to the World Bank classifications of highly indebted poor countries, Ethiopia is one of the severely indebted low-income countries. Ethiopia's public foreign debt has changed significantly in magnitude and composition over the last three decades. In 1979/80 during Military period, it stood at about 2950 million birr (2.59% of RGDP) which is equivalent to 16075 million birr of Gross national saving (14.13% of RGDP) and 20452.9 million birr of Gross capital formation (investment) (17.97% of RGDP). in 1991/1992, at establishment of Ethiopian People Representative Democratic Front (EPRDF), the Ethiopia's public foreign debt was 6551.4 million birr(5.03 % of RGDP) which is equivalent to 16350 million birr of Gross national saving (12.56% of RGDP) and 16754.5 million birr of Gross capital formation(12.87% of RGDP) and in 2018/19, the public foreign debt of Ethiopia was 781900 million birr(41.71% of RGDP) which is equivalent to 606549.7 million birr of Gross national saving(32.35% of RGDP) and 627055 million birr of Gross capital formation (33.45% of RGDP). This indicates Ethiopian economy is low and it is not sufficient to finance saving and investment, hence public foreign debt is necessary to finance this saving and investment gap and it increasing significantly after the fall of Imperial regime, more

specifically as public foreign debt is increasing, savings and investment are increasing in Ethiopia under the period of study.

1.2. Statement of the Problem

One of the key components of the movement towards economic globalization or integration by the world economy is foreign capital flows. In the face of domestic resource deficiency in financing long-term development, most developing countries including Ethiopia have still been in much reliance on external financial sources. The need for foreign capital to complement domestic resources has been welcomed as a catalyst of growth and development, since it is considered as the central element of the process of economic growth in developing countries (Sophannak and Darith, 2017).

In very recent years, Ethiopia have been starting to achieve Growth and Transformation Plan (GTP), five years ongoing developmental plans aimed to record fast, sustainable and broad based economic growth and simultaneously so as to attain Millennium Development Goals. This ongoing developmental plan needs huge resources. Thus in order to finance these projects the country is mobilizing resources from internal and external. However, the stock of external debt in Ethiopia is increasing i.e. USD 5516 in 2000, USD 6229 in 2005, USD 7335 in 2010, USD 12575 in 2013 and USD 20414 in 2015 in million (WB, 2017), USD 21276.30 in 2016, USD 23337.24 in 2017, USD 25773.45 in 2018 and USD 27039.25 in 2019(MFDMD, 2019).

The analysis of foreign debt based on the source of loan can be divided in to two sub categories those are public foreign debt [5]and private foreign debt[6]. Both types of foreign debts have their own side effects on economy (Cecchetti et al., 2011) and particularly on savings and investment. Therefore, the total foreign debt should be decomposed to private foreign debt and public foreign debt in order to analyze their effect on saving and investment. This separation of debt will bring the real effects of debt level on the economy and it will identify the channels through which debt

[5] Public foreign debt is the foreign debt obligation of the public sector that includes the long- term obligations of the central government foreign debt and government guaranteed foreign debt

[6] Private foreign debt is private non-guaranteed foreign debt comprises long-term external obligations of private debtors that are not guaranteed for repayment by a public entity.

can affect the economy (Vosyliute, 2014) and particularly to answered which debt can affect savings and investment.

Serious problem confronting poor countries including Ethiopia is savings and investment gap. Because of this gap, these countries faced challenges to finance investments needed from domestic saving (Deaton, 2005 and Rogg, 2006). According to Tadese (2011), "Ethiopian economy is known for the presence of resource gap. The saving investment gap has grown from 1.1% of GDP during 1964-74 to 6% of GDP during 1974-1991 and 11.7% of GDP during 1991-2008" the gap was grown to 16.7% in 2010/11 and come down to 10 percent in 2014. Therefore, to fill this resource gap external financing particularly public external debt becomes an important source of development finance.

Some studies pin down vital role of the emerging field of foreign debt and debt indicators in developing countries like Pakistan, Nigeria, Botswana and the like with emphasis on empirical relation of foreign debt, savings and investments, however, they did not address; First, they did not separate total foreign debt as public foreign debt and private foreign debt. Thus, there is less evidence on the specific channels through which external debt affects saving and investment. Second most of the previous studies did not separate the debt burden into total external debt stock and total external debt servicing. In this paper, the effect of public external debt is separated into total stock of public external debt effect and repayment or servicing of public external debt effect. In addition, the causal relationship of these variables with savings and investment is examined. Third most of the previous studies are used Johansson co-integration method of vector autoregressive method as their method of analysis. Even though the Johnson's Co-integration technique is one of the widely used methods of time series analysis, its outcome could not be reliable for small sample size; that is observations less than eighty years for the time series data (Narayan, 2005; Udoh et.al, 2012). Relatively, the Autoregressive distributed lag (ARDL) method has some advantage over the Johnsons method (Pesaran et al., 1999). These advantages are it can be applied irrespective of whether the regressors are I (1) and I (0). It can also provide valid and statistically significant results and avoid the problems of biasness on small sample size (Narayan, 2005; Udoh et.al, 2012).

In addition, some studies pin down vital role of the emerging field of foreign debt and debt indicators in Ethiopia economy with emphasis on empirical relationship of foreign debt and economic growth. However, Savings and investment are the two major macroeconomic variables that support and sustain economic growth (Hunt, 2007), there seems to be a gap in the literature of foreign debt as the issues of the effect of public foreign debt with savings and investment in Ethiopia because growth and development of Ethiopian economy cannot be fully understood without a closer look at the contribution of external debt as its effect on savings and investment. Only Teklu et al. (2014) studied the nexus between public external debt and capital formation in Ethiopia and no one studied public foreign debt and savings in Ethiopia. Therefore, to best knowledge of the researcher, there is no study that has been conducted in Ethiopia on this title particularly public foreign debt and savings.

1.3. Research Hypothesis

H_{01}: There is no direction of causality between Public foreign debt with savings and investment in Ethiopia

H_{11}: There is a direction of causality between Public foreign debt with savings and investment in Ethiopia

H_{02}: There is no long run and short run relationship and no statistical significance between public foreign debt with savings and investment in Ethiopia

H_{12}: There is long run and short run relationship and statistical significance between public foreign debt with savings and investment in Ethiopia

1.4. Objectives of the study

The main objective of this study is to examine the effect of Public foreign debt on savings and investment and their causality in Ethiopia. Specifically, this study going to address the following specific objectives:

- ✓ To examine the long run and short run relationship between public foreign debt with savings and investment in Ethiopia.
- ✓ To identify the direction of causality between public foreign debt with savings and investment in Ethiopia.
- ✓ To see the trends of public foreign debt, savings and investment in Ethiopia.

1.5. Significance of the study

Information on whether the public foreign debts have implications on national savings and investment is very important. The valuable of this study is used for substantiating inputs of the policy makers, academicians and researchers. The study uses as reference of limited knowledge of researchers as they concluded public foreign debt did not necessary in order to fulfill savings and investment gaps of developing country particularly in Ethiopia.

Thus, since underdeveloped countries have very low savings rates and are unable to adequately finance investment, foreign debt becomes a necessary tool because it allows developing countries to invest more than they can save domestically (McKinnon, 1964). The Financing Gap theory also asserts the same and it puts forth the argument that; just as in the stages of development as coined by Rostow (1960), developing countries need high levels of investment for the "take-off" stage, which is fulfilled by external financing if the developing country does not have enough resources.

In order to achieve successfully sustainable investments and savings, ensuring adequate levels of saving remains a central policy concern in order to provide sufficient financing for investment and to avoid balance of payments disequilibria. Hence in developing country particularly Ethiopia which has low level of savings and low level of investment, to fill the gaps of this savings and investment, public foreign debt is helpful and positively affects savings and investments. This study gives a direction to the role of public foreign debt on savings and investment in Ethiopia.

1.6. Scope and Limitation of the study

This study examines the effect of public foreign debt on savings and investment and their causality in Ethiopia from (1979/80-2018/19). The reason for choice this period is based on the data availability. Autoregressive distributed lag co-integration approach is used in order to identify short run and long run relationship of public foreign debt, savings and investment by using such variables: savings and investment are as a dependent variable and the explanatory variables for savings are real GDP, public foreign debt, public foreign debt servicing and interest rate on bank deposits. The explanatory variables for investment are interest rate on bank advances, Growth rate of real GDP, public foreign debt and public foreign debt servicing. The most challenge while doing this study came from inconsistency of data collected for the same variable from different organizations. To avoid such inconsistency attempt is made to stick to the same source of data.

CHAPTER TWO

LITREATURE REVIEW

2.1. Theoretical review

When dealing with savings, investment and foreign debt, the theories of Keynesian, classical, saving-investment gap, debt overhang and crowding out effect can be paramount importance. The two opposing schools of thought being Keynesian and Classical theories are usually useful when dealing with economic theory of external debt and economic growth. Keynesian postulates that indebtedness stimulates demand, which lead to a proportional rise in investment through the accelerator effect, thus, leading to an increase in production. Contrary to Keynesian theory, the classical theory regards indebtedness as future tax and it is attributed to the state. According to this theory indebtedness, have adverse effects as it hinders capital accumulation and consumption by present and future generations.

The above-mentioned theories are also imperative in explaining the savings behaviors. Keynesian states that when income increases the other portion is consumed while the other one is saved. This implies a positive relationship between savings and income (Keynes, 1936) that is; income is expected to be positively correlated to savings. However, classical theory of savings postulates a positive relationship between interest and savings. This is to say, when real interest rate increases savings is also expected to increase. This relationship can be shown in the form of life cycle or inter-temporal theories of consumption and savings. Chaudhry et al. (2009) stressed that from the Classical theory of saving, the increase in interest rate has two effects on savings, the substitution effect and income effect.

By substitution effect, we mean that an increase in interest rate will induce individuals to substitute the current consumption by future consumption and hence result in increased saving. By income effect, we mean that an increase in interest rate increases the expected income of those people whose net assets are positive and it reduces the expected income of those people whose net assets are negative. Since on average net assets in an economy are positive, the increase in interest rate is likely to result in increase in expected income. This in turn will reduce the need for savings for the sake of future consumption. Thus combining the income and substitution effects, increase in interest rate could affect savings in either direction. Hence, for a country like Ethiopia where net

assets are relatively small, it is expected that the substitution effect will overweight the income effect and hence saving will be positively correlated with interest rate. The implication of this in the economy is that there will be increase in the cost of borrowing; therefore, the level of investment spending is adversely affected.

Awoke (2016), the resource gap (saving-investment gap) is measured by the difference between domestic savings and domestic investment. However, developing country in general and Ethiopia in particular has low level of domestic savings. Therefore, this low level of domestic saving is not sufficient to implement investment or capital formation due to this there is resource gap. Therefore, to fill this resource gap, foreign borrowing is important mechanism.

Debt overhang is an incident where considerable resources of a nation are used for debt servicing so that it suppresses the economic growth due to its weight on the domestic production (Udeh, Ugwu&Onwuka, 2016). Debt overhang is also observed when a country's level of debt is bigger than its financial capability to keep to the debt terms and agreement, which involves debt servicing and repayment arrangement and it is measured by ratio of debt to GDP. This theory is established on the principle that if the level of debt exceeds the country's capacity to refund with some imminent likelihood, expected debt service is anticipated to be an increasing function of the country's economic growth level (Adedoyin et al., 2016).

Debt overhangs theory centered on the adverse effects of external debt on investment in physical capital. The scope of the theory is, however, much broader: a high level of external debt can also reduce a government's incentive to carry out structural and fiscal reforms, since any strengthening of the fiscal position (including that generated indirectly through structural reforms) could intensify pressures to repay foreign creditors. These disincentives for reform are of special concern in low-income countries, where an acceleration of structural reforms is needed to sustain higher growth to meet the Millennium Development Goals (Clements et al, 2003).

Literatures on crowding out effect of external debt on savings and investment are also reviewed in this unit; the crowding out effect is captured by the ratio of debt service to exports of goods and services. As external debt of a country increases, it will reduce fund (export earning) available for the expansion of investment, since the fund will be utilized for the repayment of loans. This effect discourages capital formation and encourages capital flight. It has also determinant effect of

government expenditure. The government will be forced to shift resource from social and economic infrastructure development to servicing of debt, which diminishes productivity as well deteriorate the quality of investment mix. Since, the government spending has complimentary with private investment; lesser investment on infrastructure negatively affects private investment. The country's foreign reserve will also frequently divert for loan repayment, even the foreign aid sometimes used for the repayment of the loan (Hana Argaw, 2013)

2.1.1. The Need for External Finance

In this period of expressive growth and development, it is difficult for a country to finance all of its development spending with its own resources. As a result, to cover up the gap between its expenditures and revenues, it has to borrow one way or another from internal and external resources. As Befekadu (1992) identified, the less developed countries like Ethiopia suffer from an overriding vicious circle of low production and absence of surplus for economic development. Therefore, there is small capacity to save, resulting from low level of real income, which is an indication of low productivity, which in turn is due to mainly to the lack of capital. Keeping this in mind, the lack of capital is also a result of small capacity to save.

It is evident that to break out of this vicious circle, the country must enlarge its savings, since the crucial role of capital in the production process is unquestionable. Given the need for huge capital stock and the inadequacy of domestic saving to finance investment that would make this possible, domestic saving should be supplemented by foreign resources. The extra need of investment is quite increasing the call for external debts also. Even domestic saving rates are high enough; necessity of foreign exchange is still inevitable because of requirement of importing investment goods. In this framework for the lack of savings and foreign exchange, the needs for external sources come into being so this incident makes the external debts inevitable(Mulugeta,2014).

In order to enhance economic performance most of the poor countries engage investments that are greater than their domestic savings, foreign finance in the form of external debt becomes extremely necessary. Chenery and Strout (1996) showed that this finance in the form of aid contributes to growth by relieving some of the potential bottlenecks of savings and foreign exchange. However, many bankrupt African nations witnessed slow growth in the late 1970s and early 1980s. This slow growth resulted in wide spread poverty and inability to reputation the foreign liabilities incurred.

2.1.2. Evolution of African Debt Crisis

Many researchers discovered that, the least developed countries (LDCs), accumulating huge debts, are in the same situation. In addition to their budget deficit, they do not earn sufficient foreign currency from the exports of their primary commodities to pay for the expensive finished goods they import. The wealthier nations, through international banks and government aid, lend them the difference. Each year those poor nations need high amount of loans to finance their deficits, and as a result, their debt goes on accumulating. Hence, these poor nations are forced to supply their low priced raw materials to their rich creditors and incapable to utilize their resources for developing their own economies (Mulugeta, 2014).

As Dauda (2007) indicated, Africa's external debt troubles and its resource necessities are directly associated to its deprived capacity to accumulate capital and to grow. Though, since the beginning of the crisis in the early 1980s, the debt-ridden countries have been transferring billions of dollars every year to the wealthier nations in debt service at the cost of offering domestic services in the affected poor countries. For this and other reasons, debt service is accounting for a large percentage of Africa's GDP annually. Despite the remarkable progress made in the debt condition of most middle income debtor countries given that the inception of the debt crisis in 1982, a group of low income countries classified as heavily indebted poor countries (HIPCs) has continued to experience severe difficulties in managing the servicing of their relative high stock of external debt. Out of the 41 countries classified as HIPCs, 33 (or 80 percent) including Ethiopia are in sub-Saharan Africa.

As Mahdavi (2004) mentioned, during late 1970s, a large number of countries in Sub-Saharan Africa experienced financial crisis that were characterized by unsustainable fiscal deficits. At that time, however, current account deficit was considered normal. As a result, countries were encouraged to borrow from abroad to finance their deficits and to create sympathetic environment that attracts foreign investment to boost economic growth. In this economic incident, little attention was paid for those borrowing countries economic policy and ability to repay the borrowed funds, which is cited as a major cause of Africa debt crisis. During the late 1970s and early 1980s, commercial banks pushed a large volume of OPEC money in the form of loans to developing countries to support deficit balance of payments and for the expansion of their export sectors.

Such type of external borrowing provides not only benefit but also costs to the debtor countries. As a result, in the current trend of debt crisis, in most of Sub-Saharan Africa countries the cost of external borrowing seems to exceed the benefits. The burden of debt service is determined by the size of the debt and interest rate. As the volume of debt grows or the interest rate rises, so do the debt-service burden. Since, foreign debt is usually contracted in foreign currency, debt service payments have to also be made in foreign currency. In other words, a debt service payment is done by the use of foreign exchange or export earnings (Mahdavi, 2004).

Moreover, debt service complexity may happen in a situation where the export earnings decline or where interest rate rises, causes an exceptional increase in debt service payments. This is an experience and prominent feature of debt-ridden SSA countries in general and Ethiopia in particular. Africa is the world's most comparatively debt-ridden and aid dependent region of the world. Consequently, much of the resources that could have been transferred back in to investment are used to service debt or misused by corrupt African leaders. These countries are so loaded and weighed down by debt service obligations that their economies and financial systems have virtually crippled as they thrash about to go forward away of servicing their external debts. In this method, their economic and social welfare systems have deteriorated beyond expected level (Richard and Nwanne, 2003).

In addition, worldwide economic shocks in the 1970s and 1980s particularly that of oil price distress, high interest rates and economic recessions in the developed countries, and then fragile primary commodity prices are usually referred to as the foremost contributors to debt explosion in the developing countries (IMF, 2000). Abinet (2005), the external debt crisis of sub- Saharan Africa, like its Latin America counterpart, is not yet over. A significant number of countries in SSA have, in general adopted a development strategy that lies heavily on foreign financing from both official and private sources. Therefore, many low and middle-income countries began to borrow seriously in the 1970s and 1980s to fund development projects, reduce poverty and increase economic growth.

However, those countries tend to have limited access to private sources because of their lack of financial resources and current economic status hence primarily borrowed from public institutions. In addition, high-income country governments established export credit agencies to promote the export of products to other nations including developing countries. Middle-income countries with

more stable finances typically borrowed from commercial banks located in developed countries (Green, 1998). While, official creditors come into view to be flexible in debt rescheduling and restructuring, even so, no signs of obvious progress have been noticed in the indebted countries.

Those debt-ridden countries began to have problem making debt service payments in the early 1980s. Difficulties in paying debt were primarily due to regional conflicts, adverse economic shocks, reduced export earnings, high interest rates and poor financial management by the national governments. Most of the indebted poor countries usually had low rates of foreign direct investment (FDI) and a limited source of exports to supply themselves with foreign currency. These factors imposed relatively small limits on the amount of foreign debt that the country could service. External debt became a particularly difficult burden for low-income countries that were also grappling with poverty and development issues. Many researchers conclude that for many countries in the region the stock of external debt has built up over recent decades to a level that is widely viewed as unsustainable (Awoke, 2016)

When compared with the nations export earnings and GNP, SSA's debt is the highest of any region in the world (Klein, 1994). According to International Labor Organization (1995) as cited by Abinet (2005), Sub-Saharan countries external debt is the uppermost in the world as a proportion of GDP; a number of countries in the region are spending more than half of their export earnings to service foreign debts. The level of debts in these countries are so big in relation to their foreign exchange earnings potential that would be impossible to pay them off even if secured high level of economic growth. Principally as a consequence of debt servicing, flow of capital from Sub-Saharan Africa is significantly more than flow of new capital to the region.

As Ajayi and Khan (2000) pointed out, the galloping debt accumulation of SSA countries is acute for a number of reasons. Primarily, the external debt is massive relative to the size of the economy and has led, in many cases to capital flight and discouragement of private investment. Next, debt-servicing payments absorb a major proportion of export earnings, which can be used as source of finance for public expenditures to maximize social welfares. Third, debt burden threatens not only the implementation but also the prediction of success of adjustment programs. Fourth, given the time spent on external debt negotiations and its management, debt has a negative impact on an economy's overall growth and growth prospects.

In general, the accumulation of external debt in Africa in the 1970s and 1980s can be traced to a combination of both internal and external factors. The factors behind the increase in the external debt burden in these countries are varied and interrelated. However, a number of studies in the literature have summarized these factors to include, but not limited to: First, exogenous factors such as adverse terms of trade shocks; Second, the absence of sustained adjustment policies, particularly when facing exogenous shocks, which gave rise to sizeable financing needs and failed to strengthen the capacity to service debt; Third, the lending and refinancing policies of creditors, particularly lending on commercial terms with short repayment periods by many creditors in the late 1970s and early 1980s and non-concessional rescheduling terms for most of the 1980s.

Fourth, in addition to high interest rate, the lack of prudent debt management by debtor countries, driven in part by excessive optimism by creditors and debtors about the prospects for increasing export earnings and thereby building debt-servicing capacity; Fifth, lack of careful management of the currency composition of debt; and the last but not the least, political factors such as civil war and conflicts. Among other things, all these both internal and external factors made Africa to be a prominent feature of debt-ridden and debt crisis region in the world.

2.1.3. Sources of Public Foreign Debt in Ethiopia

Under the international financial market, the lender countries and institutions can be categorized in to multilaterals, bilateral and private creditors. The multilateral creditors contain big economic institutions such as international monetary fund(IMF), international development associations(IDA), African development fund(AfDF), African development bank(AfDB), Arab Bank for Economic Development in Africa (BADEA), European Investment Bank(EIB), International Fund for Agricultural Development(IFAD), Nordic Development Fund(NDF) and OPEC Fund for International Development(OFID). While the group of official bilateral creditors includes the Paris club creditors, non-Paris club creditors, and the private creditors are those, which are Commercial Bank creditors, suppliers, Bond, and Notes Holders (EUROBOND).

Table 1: The share of each foreign lender from the total borrowing (percentage share)

Creditors	Years				
	2014/15	2015/16	2016/17	2017/18	2018/19
1. Multilaterals	34.87%	36.28%	39.02%	40.71%	43.21%
AfDB	-	-	0.68%	0.57%	0.53%
AFDF	6.91%	7.01%	7.25%	7.36%	7.34%
BADEA	0.38%	0.36%	0.37%	0.35%	0.33%
EIB	0.43%	0.35%	0.30%	-	0.29%
IDA	24.23%	26.05%	28.02%	29.97%	32.83%
IFAD	1.16%	1.10%	1.15%	1.16%	1.30%
IMF	1.31%	0.91%	0.61%	0.35%	0.14%
NDF	0.16%	0.13%	0.12%	0.11%	0.10%
OFID	0.23%	0.26%	0.38%	0.39%	0.34%
2. Bilaterals	31.92%	34.84%	34.88%	33.08%	31.14%
Paris club	2.28%	2.24%	2.26%	2.11%	2.06%
Non-Paris club	29.71%	32.78%	32.79%	31.08%	29.08%
3. Private creditors	33.21%	28.87%	26.11%	26.21%	25.65%
Commercial banks	13.93%	12.04%	10.82%	13.32%	14.50%
Suppliers	13.90%	12.09%	10.98%	9.10%	7.46%
Bond and Notes Holders (EUROBOND)	5.37%	4.69%	4.27%	3.86%	3.70%
Total	100%	100%	100%	100%	100%

Source: MFDMD (2021)

Although the multilateral creditors have a largest share in giving credit to the Ethiopian government, the share of each creditor is different from year to year. For example, in 2014/15, the multilateral creditors lend 34.87% of the total borrowing, the bilateral creditors share was 31.92% of the total money and the private creditors lend 33.21%. From the bilateral creditors, 2.28% was from the Paris club creditors and the remaining 29.71% was from the Non- Paris creditors. At the same year, only 33.21% of the total borrowing of the Ethiopian government was from the Private creditors, which are commercial creditors (13.93%), suppliers (13.90%) and Bond and Notes

Holders (5.37%). After 5 years in the fiscal year of 2018/19, these figures are changed and the share of multilateral creditors was 43.21% of the total borrowing. The bilateral creditors share at this time decreased 31.14% (of which 2.06% was from the Paris club creditors and the remaining 29.08% was from the non-Paris creditors) and the private creditors decreased to 25.65%(of which 14.50% was from commercial banks creditors, 7.46% was from suppliers and 3.70% was from Bond and Notes Holders) of the total borrowing. The current level of external public and publicly guaranteed debt is largely concessional and is held almost equally between multilateral and bilateral creditors. From multilateral creditors, the International Development Associations (IDA) have a significant share, from the bilateral creditors, the non-Paris Club creditors have a significant share.

2.2. Empirical Review

There are various studies that measured the effects of foreign aid inflows on economic growth, savings and investment, but their results are not consistent.

Rosemary (2018) studied the effect of foreign debt servicing on public investment in Malawi by using time series data from 1976-2015, by employing Autoregressive Distributed Lag (ARDL) modeling and she conclude that foreign debt servicing had a negative effect and statistical significant on public investment.

Okafor and Tyrowicz (2008) estimate the causality between foreign debt and domestic savings in the context of developing countries from 1975-2004 for Sub-Saharan Africa and Latin America. They employed regression Analysis and their results indicate foreign debt has negative impact for domestic savings in long run.

Aliyu and Usman (2013) studied the impact of external debt, public debt and debt servicing on national savings in Nigeria by using Johansen co-integration technique and VECM and they conclude that external debt has negative effect on savings whereas public debt and debt servicing have positive effect on savings.

Muhammad (2016) studied the impact of external debt on capital formation in Nigeria by using time serried data from 1980-2013, by employing Autoregressive Distributed Lag (ARDL) modeling and he conclude that external debt had a negative effect and statistical significant on capital formation.

Ndemange (2018) studied the impact of external debt servicing on capital formation and Gross domestic product in Kenya using time series data from 1984-2014, by employing Regression analysis and she concluded that external debt servicing had negative and significant effect on both capital formation and Gross domestic product.

Farhana and Chowdhury (2014) studied the impact of foreign debt on growth in Bangladesh using time series data from 1972-2010, by employing Autoregressive Distributed Lag (ARDL) modeling and they conclude that there is a significant adverse effect of debt on growth in Bangladesh.

Kasidi and Said(2013) studied the Impact of External Debt on Economic Growth: A Case Study of Tanzania using time series data from 1990-2010, by employing Johansen co-integration technique

and they conclude that external debt helps developing countries to meet developing needs. While debt servicing seeks development by restoring credibility to existing and new creditors.

Muhammad et al., (2010) studied domestic debt and economic growth in Pakistan using time series data 1972-2009, by employing ordinary list square technique and they conclude that stock of domestic debt affects economic growth positively in Pakistan.

Khan (1992) examines the impact of real per capita income, GDP growth rate, trade, dependency ratio, foreign capital inflows, and foreign aid to GNP ratio on the national saving rate of Pakistan, using time-series data for the period 1959-60 to 1987-88. The author estimates the model with OLS techniques and finds that one of the reasons for the low rate of savings in Pakistan is foreign capital inflow. The study confirms foreign capital inflow's depressing effect on national savings in Pakistan. According to the results, a one percent increase in the inflow of foreign capital reduces savings by 0.21 percent.

Shabbir and Mahmood (1992) study the impact of foreign financial inflows such as foreign private investment and aid on economic growth and domestic savings of Pakistan over the period of 1959-60 to 1987-88. The authors use the Two Stage least square method for estimation of simultaneous equations. The main conclusion of their study is that net foreign private investment and disbursement of grants and external loans have a positive impact on the rate of growth of real GNP in Pakistan and that foreign financial inflows may discourage domestic public and/or private saving behavior and resource mobilization efforts.

White (1992) presents rich reviews of the long and yet unresolved debates. For applied economists the message is that most attempts at assessing the impact of aid on saving, investment and growth suffer from various flaws. These include unresolved theoretical issues, faulty data, particularly for cross-country analysis, specification errors that call into question the scientific rigor of the findings and the difficulty in modeling the mechanisms through which aid actually affects various macroeconomic variables including growth. These reviews and the conclusions would give pause to applied economists seeking to empirically test the aid-growth association.

Kemal (1997) estimates the saving rates against foreign capital inflows along with various other variables that affect the saving behavior. The study finds that foreign capital inflows have entirely been used to finance consumption in Pakistan. Therefore, the increase in foreign capital has

resulted in lowering the saving rate by the same magnitude and as such, foreign aid may have contributed almost nothing to growth.

Kemal (2001) explains the debt accumulation and its implications for growth and poverty in Pakistan. The author shows that debt accumulation and debt servicing adversely affect the poor. The study illustrates that even though debt burden as a percentage of GDP of Pakistan exceeds that of all the South Asian countries yet it still is not so high as to qualify for a debt write-off. This implies that Pakistan has the capacity to service the debt.

Were (2001) examines the impact of external debt on economic growth and private investment in Kenya. The author observes the structure, magnitude, composition and determinants of Kenya's external debt. The study finds that debt accumulation and current debt flows discourage growth. However, current debt flows stimulate investment and debt accumulation deters investment. The study also reports that the causes of external debt in Kenya can be attributed to both internal and external factors. Internal factors are expansionary fiscal policies and highly distorted trade policies, while external factors include deterioration of terms-of-trade leading to BOP deficits, high world interest rates and increased protectionism by developed countries, which tends to discriminate against exports from less developed countries.

Siddiqui and Malik (2002) estimate directly the impact of debt on GDP growth rate and argue that debt accumulation and growth have a non-linear relationship: up to a certain level, the impact is positive and beyond the threshold level, the relationship turns negative. The study reports mixed evidence regarding the impact of debt burden on economic growth. While debt accumulation in other countries of south Asia so far has not had a negative impact on the growth rate, debt accumulation in the case of Pakistan in resulting in low growth.

Mohey-ud-din (2006) analyzes the impact of the foreign capital inflow on GDP Growth in Pakistan during 1975-2004. He concludes that the foreign capital may be helpful in boosting economic growth only under the presence of appropriate monetary, fiscal and the trade policies. Major concern of the policies should be on the inflow of FDI and other form of foreign private capital, while the inflow official aid, loans, grants and debts should be minimized.

Oageng and Boitumelo (2017) analyze the effect of external debt on national savings in Botswana during 1980-2014 by using Johansen technique and Vector Error Correction Model and they conclude that external debt had a negative effect on national savings.

Ogunjimi (2019) analyze the impact of public debt on investment in Nigeria during 1981-2016 by using Autoregressive Distributed Lag framework and he conclude domestic debt improves both private and public investment in the short- run and long- run that is the domestic debt crowds in both private and public investment but it does not attract Foreign Direct Investment. The result also showed that external debt crowds-in private investment in both the short run and the long run crowds out public investment and does not influence Foreign Direct Investment.

Forgha et al., (2014) analyze external debt, domestic investment and economic growth in Cameron Based on a system estimation approach, using Two Stage Least Squares as an estimation technique in the case of Cameroon for a period of 34 years (1980-2013) and they concluded that domestic investment has positive effect on economic growth and external debt has negative effect on economic growth in Cameron.

Mulugeta (2014) studied the impact of external debt on economic growth in Ethiopia using time series data from 1983/84-2012/13 by using Johansen Maximum Likelihood approach for long run relationship and Vector error correction model (VECM) to short run impacts and he concluded that external debt and Gross domestic product have long run relationship. The result of the study reveals that real GDP is influenced negatively by the past stock of external debt and positively by the current external debt inflows. This is indicating the existence of debt overhang problem and crowding out effect in Ethiopian economy.

Olifan et al., (2018) studied the determinant of external debt in Ethiopia using time series data by using ARDL model from 1981-2016 and they concluded that Primary budget deficit as ratio of GDP and domestic saving as ratio of GDP has positive impact on Ethiopian external debt accumulation while inflation rate and resource balance as ratio of GDP have negative impact and exchange rate negatively related to external debt and statistically insignificant.

Kassu et al. (2014) examined the nexus between public external debt, capital formation and economic growth in economy of Ethiopian using time series data by using Johansen approach from 1970-2013 and concluded that public external debt as a percentage of GDP has a positive and

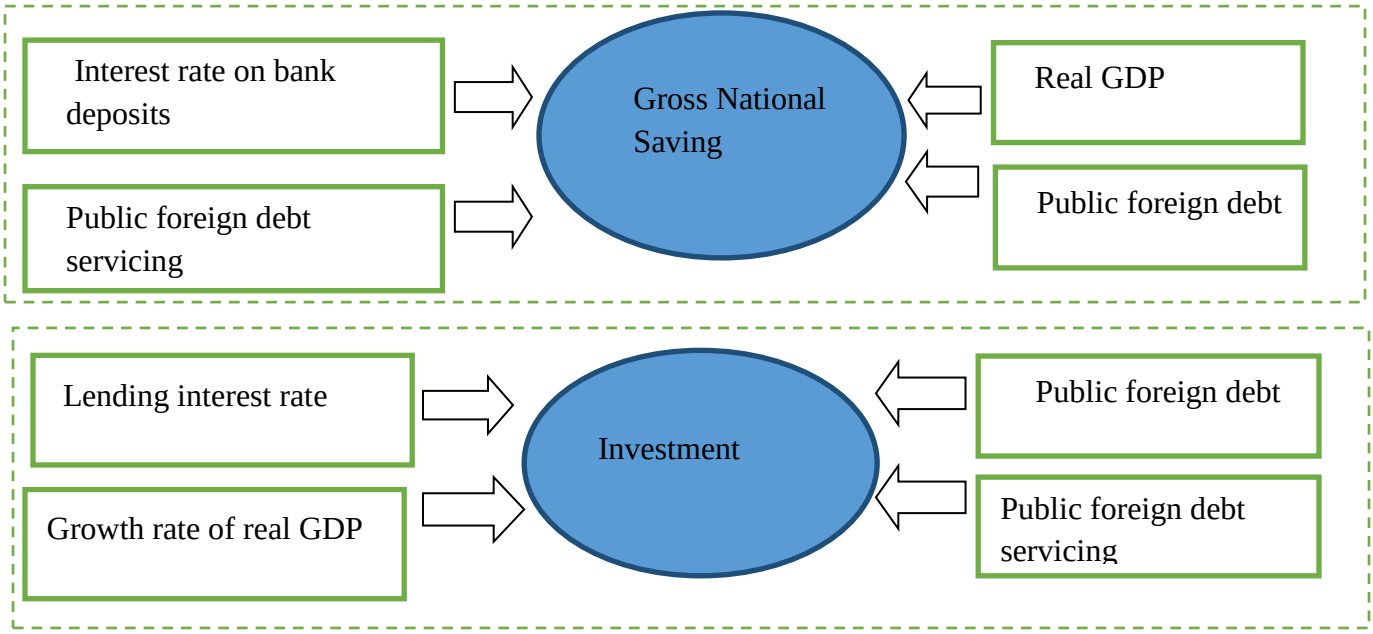
significant effect on capital formation in the long run and negative in the short run. In addition, public external debt as a percentage of GDP has a negative and significant relationship with real GDP in the long - run and no significant effect on the short- run.

Tewodros Gebru(2015) studied the determinants of economic growth in Ethiopia using time series data by using ARDL Approach to Co-integration and Error Correction Model from 1974-2013 and he concluded that debt affects economic growth negatively and statistical significant.

In general, the above reviewed papers show that some researchers saw the effect of external debt on savings, the effect of external debt on investment and others saw the effect on external debt on economic growth, to best knowledge of the researcher, there is no studies that have been conducted by the same title in Ethiopia.

2.3. Conceptual Frameworks

As discussed above about Public foreign debt, savings and investment, the following conceptual framework shows the most explanatory variables on saving and investment. The researcher designs this conceptual framework's himself.



Source: own design (2021)

Figure 1: Conceptual framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Types and Source of Data

The sample period for this study is from 1979/80 to 2018/19. As the success of any econometric analysis ultimately depends on availability of appropriate data, therefore it is essential to discuss about the source and nature of the data. The study is conducted based on secondary data from domestic and foreign sources. For the domestic sources from documents of the former Ministry of Finance and Cooperation(MoFEC) the now Ministry of Finance (MoF), National Bank of Ethiopia (NBE) and Plan and development commission while for external sources from world debt tables, world development indicator, different world bank report and IMF publications.

3.2. Method of Data Analysis

To achieve the objectives of the study, in the data analysis, both descriptive and econometric analysis be employed. To examine and understand the relationships of public foreign debt, savings and investment in Ethiopia, the study started by applying descriptive statistics. Descriptive statistics measurements such as mean, maximum, standard deviation and minimum value employed.

The Econometric analyses were also being used to investigated the causal relationship of public Foreign debt with savings and investment and determine the reliability of the statistical criteria. The goal of most empirical studies in econometrics is to determine whether a change in one variable causes a change in, or helps to predict another variable. Therefore, based on the objectives of the study the estimation technique is ARDL co-integration and the direction of the variables are determined by Granger causality test environment. The stationary of variables are checked by using Augmented Dickey-Fuller (1981) (ADF) test. The software's the researcher used in the analysis of the time series data was Eviews version - 10. In the study, clear, accurate and appropriate ways of presented the data were made.

3.3. Model specification

The paper determines whether the public foreign debt has a significant effect on savings and investment in the cause of Ethiopia. In both the saving and investment functions, we include public foreign debt and public foreign debt servicing as the independent variables. Furthermore, both the

functions are specified in log forms. The reason to study the variables in log data is to avoid heteroscedasticity (Gujarati, 2004) and to show elasticity of the variables. Therefore, in order to examine the causal relationships of public foreign debt with savings and investment, the macro-economic functional form of savings and investment by using Chaudhry et.al. (2009) and by modifications are made depending on the availability of data and the economic realities of Ethiopia. The model in this study takes the form:

$$NS = f(Depir, RGDP, PFD, PFDS) \quad (9)$$

Then the empirical model of saving to be estimated involves

$$\log NS_t = \alpha_1 + \alpha_2 Depir_t + \alpha_3 \log RGDP_t + \alpha_4 \log PFD_t + \alpha_5 \log PFDS_t + \varepsilon_t \quad (10)$$

Where:

NS = Gross National savings as a percentage of real GDP at time t,

Depir = interest rate on bank deposits at time t

RGDP = Real Gross Domestic product at time t

PFD = stock of Public foreign debt as a percentage of real GDP at time t

PFDS = Public Foreign Debt Servicing as a percentage of exports at time t

$\alpha_1, \alpha_2, \alpha_3, \alpha_4 and\ \alpha_5$ = parameters to be estimated in the model.

ε_t = Error terms at time t

Log = natural logarithms

The macro-economic functional form of investment is:

$$GCF = f(Leir, GRGDP, PFD, PFDS) \quad (11)$$

Then the empirical model of investment to be estimated involves:

$$\log GCF_t = \beta_1 + \beta_2 Leir_t + \beta_3 GRGDP_t + \beta_4 \log PFD_t + \beta_5 \log PFDS_t + v_t \quad (12)$$

Where

GCF= Gross capital formation (Gross investment is proxy by Gross capital formation) and as a percentage of real GDP at time t

Leir = Lending interest rate at time t

GRGDP = Growth rate of real GDP at time t

PFD = stock of Public foreign debt as a percentage of real GDP at time t

PFDS = Public Foreign Debt Servicing as a percentage of exports at time t

$\beta_1, \beta_{2,} \beta_{3,} \beta_{4,} \beta_5, \beta_6$= parameters to be estimated in the model

v_t= error terms

3.4. Description of Variables and their expected signs

Public Foreign Debt (PFD): Otherwise known as public external debt is the part of total foreign debt held by creditors of foreign countries, i.e. non-residents of the debtors' country. Public foreign debt is measured as a percentage of GDP. Most of public foreign debt taken in developing countries is mainly aimed at implementing development projects. Even though there is fast economic growth, Ethiopia is challenged in financial problem to finance its mega project because there is a problem of capital in Ethiopia due to low level of saving, low investment and low productivity. For this reason, the Ethiopian external debt will increase from time to time and hence used to solve this resource gaps. The study hypothesizes increased public foreign debt flow are associated with increased level of savings and investment. As a result, public foreign debt has a positive effect on savings and investment and we expect positive sign. This hypothesis is supported by study done by Chaudhry et.al (2009) for their studied of the impacts of foreign debt on savings and investment in Pakistan, Teklu et.al (2014) for their studied of Public external debt, Capital formation and Economic growth in Ethiopia.

Public foreign debt servicing (PFDS): refers to payments in respect of both principal and interest in the public sector.it is the cash that is required to cover the repayment of interest and principal on a debt for a particular period. It is captured as a percentage of exports. Debt servicing increases with increasing debt ratios of a nation. When a developing country increases the rates of borrowings it amounts to channeling more resources towards debt service. Since national saving is the sum of domestic saving and net factor income from abroad and an increasing of debt servicing adversely affected national savings negatively through net factor income from abroad, as a result, we expected negative sign and this hypothesis is supported by Chaudhry et al., (2009). when we look at the effect of public foreign debt servicing on investment negatively, when the greater percentage of capital and foreign currency reserves goes to meet debt service and there will be a reduction in domestic resources because of transferred to principal and interest payments and will leads to poor trade performance and when the debtor countries are unable to meet their debt services promptly, they face bad credit standing and will have difficulties in borrowing and pay too much to get new credit. As a result, we expect negative sign. Clements et al. (2003), Karagol (2002), Muhammad (2016), Rosemary (2018) and Ndemange (2018) support this hypothesis.

Gross National saving (NS): the main objective of this study is how public foreign debt influences on savings and investment. Therefore, national savings and investment are both the dependent variables. National saving is defined as the sum of domestic saving and net factor income from abroad. There is no separate estimation of time series data on gross national saving, i.e. gross national saving is estimated as a residual by subtracting the private consumption expenditure and government final consumption expenditure from the Gross National product. National saving is measured as a percentage of real GDP.

Investment: the study uses gross capital formation as proxies for investment and consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. According to the World Bank database, GCF include land improvement (ditches, fences, drains and so on); plant, machinery, equipment purchases, construction of roads, railways and the like including schools, hospitals, offices, private residential dwellings and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress". Gross capital formation is measured as a percentage of GDP.

Lending interest rate (Leir): the cost of borrowing for the peoples who take loan from the banks. Higher interest rate reduces investment, because higher rate increases the cost of borrowing and require investment to have a higher rate of return to be profitable. In order to analyze its effect on investment, it expected to have a negative sign

Interest rate on bank deposit (Depir): deposit interest rate is the rate paid by commercial or similar banks for demand, time and saving deposit. An increase in interest rate will make saving more attractive and should encourage saving. In order to analyze its effect on savings, it expected to have a positive sign. This hypothesis is supported by study done by Chaudhry et al (2010) for their study of the Monetary and fiscal determinants of national saving in Pakistan.

Real Gross Domestic Product (RGDP): is an inflation adjusted measure that reflects the market value of all final goods and services produced in a country with in a particular time (i.e. one year) expressed in a base year prices and is often referred to as constant prices. It is conventionally measured as the percent rate of increase in real Gross Domestic Product. In order to avoid the inconsistency associated with different base year price while computing real GDP, this study used the real GDP (constant value), which is deflated by Ministry of Finance (MoF) based on the constant price of 2010/11. Real GDP as proxies for Economic growth has a positive effect on

national savings hence we expected to have positive sign. This hypothesis is supported by study done by Jilani et al (2013) for their study of the determinants of national savings in Pakistan.

Growth rate of real GDP (GRGDP): it measures economic growth as it relates to the gross domestic product from one period to another, adjusted for inflation. Growth rate of real GDP is expressed as a percentage that shows the rate of change in a country's GDP, typically, from one year to the next. In order to analyze its effect on investment, the expected sign of growth rate of real GDP is expected to be positive.

3.5. Method of econometric model estimation

3.5.1. Unit Root test

It is fundamental to test for the statistical properties of variables when dealing with time series data. Time series data are rarely stationary[7] in level forms. Regression involving non-stationary (I.e., variables that have no clear tendency to return to a constant value or linear trend) time series often lead to the problem of spurious regression[8]. This occurs when the regression results reveal a high and significant relationship among variables when in fact, no relationship exist. Moreover, Stock and Watson (1988) have also shown that the usual test statistics (t, F, DW, and R^2) will not possess standard distributions if some of the variables in the model have unit roots. The other necessary condition for testing unit root test when we applying ARDL model is to check whether the variables enter in the regression are not order two (I.e. I (2)), which is precondition in ARDL model. Therefore, it is necessary to test for time series variables before running any sort of regression analysis.

Non-stationary can be tested using Dickey-Fuller (DF) (1979) test, Augmented Dickey-Fuller (ADF) (1981) test, Phillip-Perron (PP) (1988) test and Kwiatkowski- Phillips-Schmidt-Shin (KPSS) test. However, to ensure reliable result of test for stationary, the study employs Augmented Dickey-Fuller (ADF) test, ADF test is considered superior because of its popularity and wide applications and this test is commonly used because of its easily applicability. This test has been

[7] A type of stochastic process that has received a great deal of attention and scrutiny by time series analysts is the so-called **stationary stochastic process.** Broadly speaking, a stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed (Guajarati 2004).

[8] spurious regression is a regression result of un related variables but strongly related as per the result

chosen for its consistency, accuracy and resourcefulness. However, the simplest starting point for testing stationary, we started with Dickey-Fuller (DF) (1979) test for unit roots.

3.5.1. 1. Dickey-Fuller (DF) (1979) Test for Unit Roots

Assume that Y_t is a random walk process,$Y_t = Y_{t-1} + \mu_t$, then the regression model becomes $Y_t = \rho Y_{t-1} + \mu_t$. Subtract Y_{t-1} from both sides of the equation

$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + \mu_t$ ---------- (13)

$\Delta Y_t = (\rho - 1) Y_{t-1} + \mu_t$ ---------- (14)

We denote $\rho - 1 = \alpha$, which can alternatively write the above equation (14) becomes

$\Delta Y_t = \alpha Y_{t-1} + \mu_t$ ---------- (15)

Where $\rho - 1 = \alpha$,Δ is change in Y_t or first difference operator and t is the trend factor, μ_t is a white nose residual. In practice, therefore, instead of estimating equation (14), we estimate equation (15) and test the null hypothesis that $\alpha = 0$, if $\alpha = 0$, then $\rho = 1$, that is we have a unit root. Meaning the time series under consideration is non-stationary.

In the case (14) where $\rho \geq 0$, that is, the time series is stationary with zero mean and in the case of (15) the series, Y_t is stationary around a deterministic trend. If $\rho > 1$, that is $\alpha > 0$, it means that the underlying variable will be explosive.

However, conducting the DF test as in (14) or (15), it is assumed that μ_t is uncorrelated. But, in the case the error terms (μ_t) are correlated, the Augmented Dickey-Fuller (ADF) is resorted to, since it adjusts the DF test to take care of possible autocorrelation in the error terms (μ_t), by adding the lagged difference term of the dependent variable, ΔY_t We noted that a random walk process may have no drift, or it may have drift, or it may have both deterministic and stochastic trends. To allow for the various possibilities, the DF test is estimated in three different forms, that is under three different null hypotheses.

Y_t is a random walk: $\Delta Y_t = \alpha Y_{t-1} + \mu_t$ ---------- (16)

Y_t is a random walk with drift: $\Delta Y_t = \beta_1 + \alpha Y_{t-1} + \mu_t$ ---------- (17)

Y_t is a random walk with drift around a stochastic trend: $\Delta Y_t = \beta_1 + \beta_2 t + \alpha Y_{t-1} + \mu_t$ ---------- (18)

Where t is the trend variable. In each case, the null hypothesis is that $\alpha = 0$, that is, there is a unit root problem (the time series is non-stationary). The alternative hypothesis is that α is less than

zero; that is the time series is stationary (there is no unit root problem). If the null hypothesis is rejected, it means that Y_t is a stationary time series with zero mean in case of (16),Y_t is stationary with non-zero mean$(= \beta_1/_{1-\rho})$ in the case of (17) and Y_t is stationary around deterministic trend in the case of (18).

3.5.1. 2.Augmented Dickey-Fuller (ADF) (1981) test

In conducting the DF test as in (16), (17) and (18); it was assumed that the error term(μ_t) was uncorrelated. However, in case the μ_t are correlated, Dickey and Fuller developed a test known as the augmented Dickey Fuller (ADF) test. This test is conducted by" augmenting" the preceding three equations by adding the lagged values of the dependent variable ΔY_t. To be specific, suppose we use(18), the testing procedure for the general ADF unit root test is specified as follows:

$$\Delta Y_t = \beta_1 + \beta_2 t + \alpha Y_{t-1} + \sum_{i=1}^{p} \theta_i \Delta Y_{t-i} + \varepsilon_t \quad ----------(19)$$

Where Y_t is a time series variables under consideration in this model at time t, t is a time trend variable, β_2 is a coefficient of time trend series, α is the coefficient of Y_{t-1}, Δ denotes the first difference operator,ε_t is the error term, p is the optimal lag length of each variable chosen such that first-differenced terms make a white noise.

Thus, the ADF test of the null and alternative hypothesis is as follows.

That is: $H_0 : \alpha = 0$(there is no stationary/have unit root), H_1: $\alpha \neq 0$(there is stationary/don't have unit root i.e. desirable)

Hence, in this study, the researcher used the Augmented Dickey Fuller (ADF) test of stationarity.

3.5.2. Optimal Lag length selection

The determination of autoregressive lag length for a time series is especially important in economics studies. Various lag length selection criteria such as Akaike's information criterion (AIC), Schwarz's information criterion (SIC) and Hannan-Quinn criterion (HQC), Final prediction error (FPE) and Bayesian information criterion (BIC) will be employed. As the outcomes of these criteria may influence the ultimate findings of a study, a throughout understanding on the empirical performance of these criteria is necessary.

Akaike Information Criterion (AIC) developed by Hirotugu Akaike in 1971; Greene (2003), has been found to be nearly unbiased estimator of selecting lag order and also it's a large sample size measure of thirty and more items, while the Schwarz Information Criterion (SIC) is a small sample

measure of less than thirty observations. Hannan- Quinn is more efficient than one hundred twenty observations. However, AIC and FPE are more appropriate observations less than sixty is a better choice for smaller sample.

Finally, the problem of over estimation, however, is negligible in all cases. As many econometric testing procedures such as unit root tests, causality tests, co-integration tests and linearity tests involved the determination of autoregressive lag lengths, the findings in this simulation study may be taken as useful guidelines for future economic researches. The model of lowest value of AIC or SIC or BIC will be chosen. The study would be used the lag selection criteria, Thus the model of AIC in lag selection is used because of its advantage for small sample size (Tsadikan, 2013) in this study. Finally, in this model, AIC selects the optimal lag length of each variable. For annual data, the number of lags typically small, 1 or 2 then chose the smallest AIC values, hence the optimal lag in this research is 1.

3.5.3. Autoregressive Distributed Lag Model (ARDL) Approach to Co integration technique or ARDL bound test.

The concept of co integration is functional to a wide range of economic models. Any equilibrium relationship among a set of nonstationary variables implies that the variables cannot move independently of each other. These linkages among the stochastic trends necessitates that the variables are co integrated. The classical regression models assume that the dependent and independent variables are stationary over time. However, most economic variables exhibit long run trend movement and only become stationary after they are differenced. Applying the classical regression techniques to the level of variables leads to a spurious correlation, particularly when the variables involved exhibit consistent trend, either upward or downward, over time. The empirical literature for unit root shows that almost all macro variables are nonstationary in level while their difference is stationary. A principle feature of co integration variables is that their time paths are influenced by extent of any deviation from the long run equilibrium the movements of at least some of the variables must respond to the magnitude of the equilibrium (Alemayehu, 2012).

Moreover, in the case where variables are difference stationary, it is possible to estimate the model by first difference. However, this gives only the short run dynamics in which case valuable information concerning the long run equilibrium properties of the data could be lost. In order to obtain both the short run and long run relationship one can appeal what is known as co integration.

Co-integration among the variables reflects the presence of long run relationship in the system and the long run relationship among the variables are confirmed by bounds test. Hence testing for co integration is the same as long run relationship (Gujarati, 1995).

After checking for the order of integration of all variables in the model, the Autoregressive Distributed Lag (ARDL) model involves two steps for estimating the long-run relationship (Pesaran et al., 2001). In the first step, the existence of long-run relationship among all variables in an equation should be examined and then in the second step the long run and short-run coefficients of the variables can be estimated in the model. One can run the second step only if we find along run co-integration relationship among the variables in the first step.

There are numbers of advantages of using ARDL model also called 'Bound Testing Approach' instead of the conventional Engle-Granger two-step procedure (1987), Maximum likelihood methods of co integration (Johansen, 1988) and Johansen and Juselius (1990). First, the ARDL model is the more statistically significant approach to determine the co integration relation in small samples as the case in this study (Pesaran et al., 2001; Narayan,2004), while the Johansen co-integration techniques require large data samples for validity. A second advantage of the ARDL approach is that while other co integration techniques require all of the regressors to be integrated of the same order; the ARDL approach can be applied whether the regressors are purely order zero [I (0)], purely order one [I (1)], or mixture of both. This means that the ARDL approach avoids the pre-testing problems associated with standard co integration, which requires that the variables be already classified into I (1) or I (0) or mixture of both (Pessaran et.al., 2001). Third, with the ARDL approach it is possible that different variables have different optimal numbers of lags, while in Johansen-type models this is not permitted. Forth, the other advantages of bound testing approach in the long run and short run parameters of the model in questions are determined simultaneously (Nasiru, 2012 as cited in Tsadkin, 2013). Finally, Appling the ARDL technique we can obtain unbiased and efficient estimators of the model (Narayan, 2004), (Harris and Sollis, 2003; Pesaran, 1995) as cited in Tsadkin (2013).

According to Pesaran et al. (2001), the ARDL modeling of unrestricted error correction model using ordinary least square model (OLS) can be represented as follows.

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{\rho} \beta \Delta Y_{t-i} + \sum_{i=0}^{\rho} \alpha \, \Delta X_{t-i} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + u_t \; ----------(20)$$

Where Δ denotes the first difference operation,Y_t is a vector of dependent variable,X_t is a vector of independent variable, ρ is optimal lag length,u_t is the residual term which is assumed to be white noise

Therefore, the long run relationship among the variables would be examined using ARDL approach to co integration (Pesaran et al, 2001) involves estimating of the error correction model (ECM) version of ARDL model for the effect of public foreign debt on savings and investment from the above equations of (10) and (12) becomes

$$\begin{aligned} \Delta LogNS_t = \varphi &+ \sum_{i=1}^{\rho} \alpha_1 \, \Delta LogNS_{t-i} + \sum_{i=0}^{\rho} \alpha_2 \, \Delta Depir_{t-i} + \sum_{i=0}^{\rho} \alpha_3 \, \Delta LogRGDP_{t-i} \\ &+ \sum_{i=0}^{\rho} \alpha_4 \Delta \, LogPFD_{t-i} + \sum_{i=0}^{\rho} \alpha_5 \Delta \, LogPFDS_{t-i} + \theta_0 LogNS_{t-1} + \theta_1 Depir_{t-1} \\ &+ \theta_2 LogRGDP_{t-1} + \theta_3 LogPFD_{t-1} + \theta_4 LogPFDS_{t-1} + \varepsilon_t \; --------(21) \end{aligned}$$

$$\begin{aligned} \Delta LogGCF_t = \emptyset &+ \sum_{i=1}^{\rho} \beta_1 \, \Delta LogGCF_{t-i} + \sum_{i=0}^{\rho} \beta_2 \, \Delta Leir_{t-i} + \sum_{i=0}^{\rho} \beta_3 \, \Delta GRGDP_{t-i} \\ &+ \sum_{i=0}^{\rho} \beta_4 \Delta \, LogPFD_{t-i} + \sum_{i=0}^{\rho} \beta_5 \Delta \, LogPFDS_{t-i} + \gamma_0 LogGCF_{t-1} + \gamma_1 Leir_{t-1} \\ &+ \gamma_2 GRGDP_{t-1} + \gamma_3 LogPFD_{t-1} + \gamma_4 LogPFDS_{t-1} + \mathrm{v_t} \; ---------(22) \end{aligned}$$

Where NS is Gross national saving, Depir is interest rate on bank deposits, RGDP is real gross domestic product, PFD is public foreign debt, PFDS is public foreign debt servicing, GCF is Gross capital formation, Leir is interest rate on bank advances, ε_t and $\mathrm{v_t}$ are the error terms, ρ is optimal lag length and Log is Natural logarithms $\theta_0, \theta_1, \theta_2, \theta_3 \; and \; \theta_4$ are long run coefficients in saving equation, $\alpha_1, \alpha_2, \alpha_3, \alpha_4 and \; \alpha_5$ are short run coefficients in saving equations.

$\gamma_0, \gamma_1, \gamma_2, \gamma_3, and \; \gamma_4$ are long run coefficients in investment equation, $\beta_1, \beta_2, \beta_3, \beta_4, \; and \; \beta_5$ are short run coefficient in investment equation. Except interest rate on bank advances and interest rate on bank deposits, all variables entered in the models are measured in millions of Ethiopian birr (ETB).

The long run relationship (bound testing approach of co-integration) is determining using F statistics to test the significance of the one lagged level variables. The joint significance of the model to be tested equation (21) and equation (22) are the following: null and alternative hypothesis for equation (21) is:

Null hypothesis ($H_0: \theta_0 = \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$(No long run relationship among the variables)) and the alternative hypothesis is $H_1: \theta_0 \neq \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq 0$(there is long run relationship among the variables) and the null and alternative hypothesis for equation (22) is:

$H_0: \gamma_0 = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0$(No long run relationship among the variables) and the alternative hypothesis is $H_1: \gamma_0 \neq \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq 0$(there is long run relationship among the variables)

According to Pesaran et al. (2001), there are two sets of critical value bounds for all classifications of regressors' namely upper critical bound value and lower critical bound value. The critical values for I (1) series are referred to as upper bound critical values; while the critical values for I (0) series are referred to as lower bound critical values. If the calculated F statistic is greater than the upper bound critical values, we reject the null hypothesis of no long run relationship among the variables. If the calculated F statistic is less than the lower bound critical values, we cannot reject the null hypothesis rather accept the null hypothesis of no long run relationship among the variables. However, if the calculated F statistic is between the upper and lower bound critical values, inference is inconclusive and we need to have knowledge on the order of integration of underling variables before we made conclusive inference (Pesaran et. al., 2001).

But Pesaran et al. (2001) developed the critical values of bound large sample data (greater than 500 sample size), Narayan (2005) also estimated the critical values by arguing that the critical values provided by Pesaran et.al. (2001), he generated a new set of critical values for small sample size (30<n<80) based on similar technique. Therefore, in this study the researcher used critical values of Narayan (2005) since the sample size of this study is 40 years' observation.

Therefore the bounds test decision entails that when computed F statistic is greater than the upper critical values (I (1)), there is co-integration, if the F statistic is less than the lower critical value (I

(0)), there is no co-integration, if the F statistic drops in between the two bounds of critical values, the test is considered in conclusive (Narayan, 2005)[9].

If there is an evidence of a long run relationship (co-integration) of the variables, the long run elasticities of the model are estimated based on the following ARDL model to investigate the effect of the independent variables on the left hand side variables in the long run. The following equations are estimated for the purpose of determining the value of the coefficients of the independent variables in the long run.

$$LogNS_t = \varphi + \sum_{i=1}^{\rho} \alpha_1 LogNS_{t-i} + \sum_{i=0}^{\rho} \alpha_2 Depir_{t-i} + \sum_{i=0}^{\rho} \alpha_3 LogRGDP_{t-i} + \sum_{i=0}^{\rho} \alpha_4 LogPFD_{t-i} + \sum_{i=0}^{\rho} \alpha_5 LogPFDS_{t-i} + \varepsilon_t \quad (23)$$

$$LogGCF_t = \emptyset + \sum_{i=1}^{\rho} \beta_1 LogGCF_{t-i} + \sum_{i=0}^{\rho} \beta_2 Leir_{t-i} + \sum_{i=0}^{\rho} \beta_3 GRGDP_{t-i} + \sum_{i=0}^{\rho} \beta_4 LogPFD_{t-i} + \sum_{i=0}^{\rho} \beta_5 LogPFDS_{t-i} + v_t \quad (24)$$

All variables are previously defined.

3.5.4. Vector Error Correction Model (VECM)

If there is long run relationship among the variables, an error correction model can be formulated that portray both the dynamic and long run interaction between the variables. After checking the co integration relationship among the variables and estimating the long run model, the next step is to estimate the short run dynamic parameters and the adjustment parameter that measure the speed of correction to long-run equilibrium after a short-run disturbance by using the vector error correction model. The standard error correction model can be estimated as follows:

[9] The researcher decided whether the variables have long run relationship or not by using bound test are by comparing the calculated F statistic with Narayan (2005) critical values i.e. F statistic is greater than Narayan (2005) upper critical values (I (1)), there is long run relationship, F statistic is less than Narayan (2005) lower critical values (I (0)), there is no long run relationship.

$$\Delta LogNS_t = \varphi + \sum_{i=1}^{\rho} \alpha_1 \Delta LogNS_{t-i} + \sum_{i=0}^{\rho} \alpha_2 \Delta Depir_{t-i} + \sum_{i=0}^{\rho} \alpha_3 \Delta LogRGDP_{t-i} + \sum_{i=0}^{\rho} \alpha_4 \Delta LogPFD_{t-i} + \sum_{i=0}^{\rho} \alpha_5 \Delta LogPFDS_{t-i} + \gamma ECT_{t-1} + v_t \quad (25)$$

$$\Delta LogGCF_t = \emptyset + \sum_{i=1}^{\rho} \beta_1 \Delta LogGCF_{t-i} + \sum_{i=0}^{\rho} \beta_2 \Delta Leir_{t-i} + \sum_{i=0}^{\rho} \beta_3 \Delta GRGDP_{t-i} + \sum_{i=0}^{\rho} \beta_4 \Delta LogPFD_{t-i} + \sum_{i=0}^{\rho} \beta_5 \Delta LogPFDS_{t-i} + \gamma ECT_{t-1} + e_t \quad (26)$$

From equation (25) and (26), whereECT_t is error correction term and defined as:

$$ECT_t = \Delta LogNS_t - \left[\varphi + \sum_{i=1}^{\rho} \alpha_1 \Delta LogNS_{t-i} + \sum_{i=0}^{\rho} \alpha_2 \Delta ID_{t-i} + \sum_{i=0}^{\rho} \alpha_3 \Delta LogRGDP_{t-i} + \sum_{i=0}^{\rho} \alpha_4 \Delta LogPFD_{t-i} + \sum_{i=0}^{\rho} \alpha_5 \Delta LogPFDS_{t-i}\right] \quad (27)$$

$$ECT_t = \Delta LogGCF_t - \left[\emptyset + \sum_{i=1}^{\rho} \beta_1 \Delta LogGCF_{t-i} + \sum_{i=0}^{\rho} \beta_2 \Delta Leir_{t-i} + \sum_{i=0}^{\rho} \beta_3 \Delta GRGDP_{t-i} + \sum_{i=0}^{\rho} \beta_4 \Delta LogPFD_{t-i} + \sum_{i=0}^{\rho} \beta_5 \Delta LogPFDS_{t-i}\right] \quad (28)$$

Where Δ is the first difference operator, α's and β's are the coefficients relating to the short run dynamics of the models convergence to equilibrium and γmeasures the speed of adjustment parameter and should be negative and statistically significant.

3.5.5. Causality test

Granger causality test is made the selected ARDL model to identify the direction of causality between the dependent variables of national saving and investment (proxy by gross capital formation) and the independent variables. That is pair wise Granger causality test is applied on the

selected model to know the direction of causality national savings and investments with the stock of public foreign debt and public foreign debt servicing.

Granger (1985) suggests that if there is a co-integration relation between two variables, then Granger causality will exist in at least one direction. However, although a co-integration test can determine the existence of Granger causality between variables it cannot determine the direction of this relation. Engle and Granger (1987) indicate that if two variables are co-integrated then a relationship will exist that can be measured by Granger causality test.

A Granger causality test is a statistical hypothesis test will be used to find out whether a given time series can be used to forecast or predict another. According to granger (1988), if variable X granger causes another variable Y, then the past value of X helps in predicting the future value of Y, over and above the information contain in the past value of Y alone. Its mathematical formulation is based on linear regression modeling of stochastic process. More complex extensions to non-linear cases that seem to be practically difficult also exist. The mathematical approach to test whether there exist a causal relationship between X and Y can be written: Y_t=f (Y_{t-p},X_{t-p}) and X_t=f (X_{t-p},Y_{t-p}) and by extended it becomes

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + - - - \alpha_p Y_{t-p} + \beta_1 X_{t-1} + - - - \beta_p X_{t-p} + u_t \quad (29)$$

$$X_t = \delta_0 + \delta_1 X_{t-1} + - - - \delta_p X_{t-p} + \sigma_1 Y_{t-1} + - - - \sigma_p Y_{t-p} + V_t \quad (30)$$

From here assume that $u_t$and V_t are uncorrelated. A unidirectional causality exists when from X to Y if the estimated coefficients on the lagged X in the first equation are statistically different from zero as a group and the set of estimated coefficients on the lagged Y are not statistically different from zero. In the same vein, unidirectional relationship from Y to X do exist when the lagged Y in the second equation are statistically significantly different from zero and the lagged X are not statistically significantly different from zero in the first equation

Bilateral causality does exist when the set of both lagged X and Y are statistically significantly different from zero in both equations but when the set of lagged X and Y are not statistically significantly different from zero in both equations, we can simply say that no causal relation between the variables (Gujarati, 2009).

The standard (Granger, C.W.J., 1988) test will be employed in the relevant literature test the causal relationship between two variables. This test state that, if past values of a variable Y significantly

contribute to forecast the values of another variable Xt+1 then Y is said to granger cause of X and to vice versa. Since we have two dependent variables (savings and investment), the test is based on the following regressions:

$$\Delta LogNS_t = \alpha_0 + \sum_{q=1}^{N} \alpha_1 \Delta\, LogNS_{t-q} + \sum_{q=1}^{N} \alpha_2\, \Delta Depir_{t-q} + \sum_{q=1}^{N} \alpha_3\, \Delta LogRGDP_{t-q} + \sum_{q=1}^{N} \alpha_4\, \Delta LogPFD_{t-q} + \sum_{q=1}^{N} \alpha_5\, \Delta LogPFDS_{t-q} + \epsilon_{1t} \quad (31)$$

$$\Delta LogGCF_t = \beta_0 + \sum_{q=1}^{N} \beta_1 \Delta Log\, GCF_{t-q} + \sum_{q=1}^{N} \beta_2\, \Delta Leir_{t-q} + \sum_{q=1}^{N} \beta_3\, \Delta GRGDP_{t-q} + \sum_{q=1}^{N} \beta_4 \Delta Log\, PFD_{t-q} + \sum_{q=1}^{N} \beta_5 \Delta Log\, PFDS_{t-q} + \epsilon_{2t} \quad (32)$$

Where $\Delta\mathrm{LogNS_t}, \Delta\mathrm{LogGCF_t}, \Delta\mathrm{Depir_t}, \Delta\mathrm{Leir_t}, \Delta\mathrm{LogRGDP_t}, \Delta\mathrm{GRGDP_t}, \Delta\mathrm{LogPFD_t},$ and $\Delta\mathrm{LogPFDS_t}$ are the variables to be tested ϵ_{1t}andϵ_{2t} are uncorrelated white noise, t denotes the time period and q is the number of lags.

3.5.6. Diagnostic test

To ensure that the models estimated in the study yield reliable estimates and not spurious results, the study conducted several diagnostic tests. These included testing for normality, serial correlation, heteroscedasticity and stability tastes. The study tested for normality using the Jarque-Bera test statistic. This test plots a histogram and computes the test statistic to determine whether the residuals are normally distributed. If the residuals are normally distributed, the histogram is bell shaped and the Jarque-Bera test statistic is insignificant.

The Breusch-Godfrey Serial Correlation LM test was also used to test for serial correlation. In this study, this test is preferred to other serial correlation tests because it is applicable whether there are lagged dependent variables or not and it can also identify serial correlation of higher orders .To test for heteroscedasticity, Breusch-Pagan-Godfrey test was used..

To test for parameter stability, the Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residual (CUSUMSQ) Plots were used. The tests plot the cumulative sum and cumulative sum of squares of recursive residuals together with the 5%

critical lines. These tests find parameter instability if the cumulative sum or cumulative sum of squares move outside the area between the two critical lines.

CHAPTER FOUR

RESULTS AND DISCUSION

4.1. Descriptive Statistics

Table 2: Summary of statistics

	GRGDP	Depir	Leir	Log GCF	Log NS	Log PFD	Log PFDS	Log RGDP
Mean	8.36	5.4	10.79	4.80	4.76	4.50	3.20	5.42
Median	8.38	5	11.13	4.65	4.67	4.44	3.02	5.29
Maximum	104.6	10	15.5	5.82	5.78	5.89	4.76	6.27
Minimum	-9.69	3	6.8	4.21	4.1	3.47	2.28	5.03
Std. Dev.	16.96	1.97	2.5	0.47	0.47	0.71	0.64	0.37
Skewness	4.79	1.04	-0.07	0.86	0.72	0.33	0.95	1.07
Kurtosis	28.14	3.62	2.2	2.68	2.66	2.15	3.03	3.10
Jarque-Bera	1175.52	7.78	1.17	5.08	3.67	1.91	6.04	7.68
Probability	0	0.02	0.56	0.08	0.2	0.38	0.05	0.02
Sum	325.91	216	431.51	192.2	190.29	180.16	128.12	216.67
Sum sq.dev.	10925.9	151.6	242.21	8.64	8.75	19.53	16.18	5.25
Observations	39	40	40	40	40	40	40	40

Source: Own computation (2021)

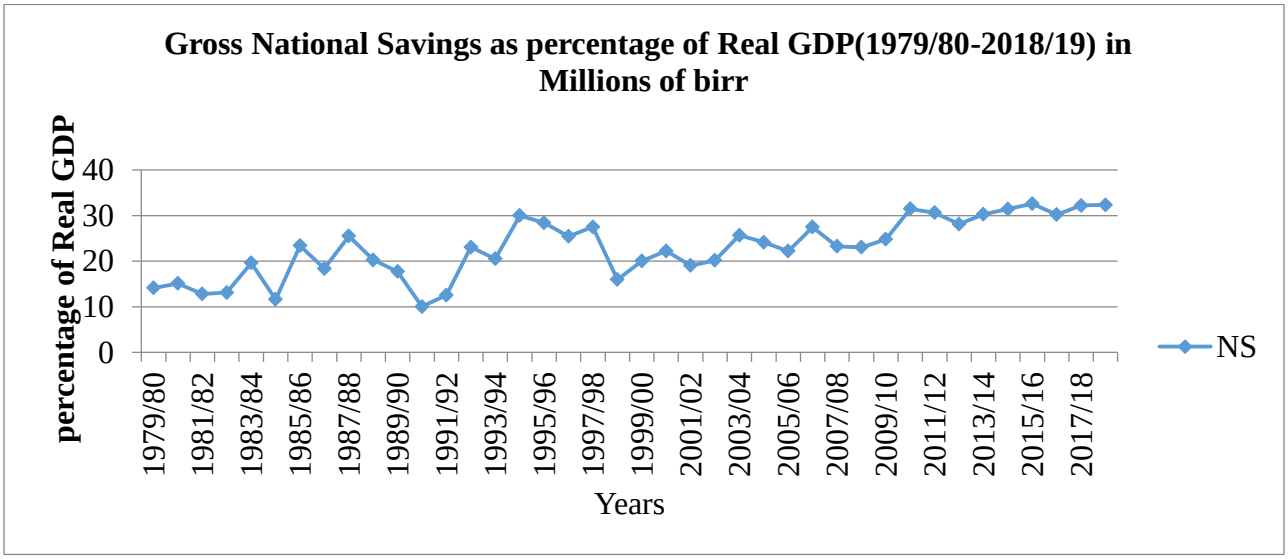
Mean and median value shows the average value of the series at meddles. In all the series, the value of means and medians are close to each other. This indicates minor symmetry but if they are far from each other they show the other way round.

4.2. Trend of savings, investment and public foreign debt

4.2.1. Trends of Savings

The low level of domestic saving is a classic feature of low-income countries in general and Ethiopia in particular (Mulugeta, 2014). This low level of domestic saving also have the cause of low level of national savings since national saving is the sum of domestic saving and net factor income from abroad.

A number of factors are generally cited to explain the low domestic saving level of countries like Ethiopia. A first factor is the low per capita income and the variation of propensity to save and income. A second factor, to the low level of domestic saving is political and macro financial instability. Third, in addition to their inefficient performance, financial institutions are concentrated in the urban areas and their networks extended slight in to the rural areas. Many researchers point out that many rural households in developing countries, particularly in sub Saharan Africa, are too poor to save (Robinson, 2011). Likewise, low saving has been a dominant feature of the Ethiopian Economy.



Source: Own drawing using NBE (2021)

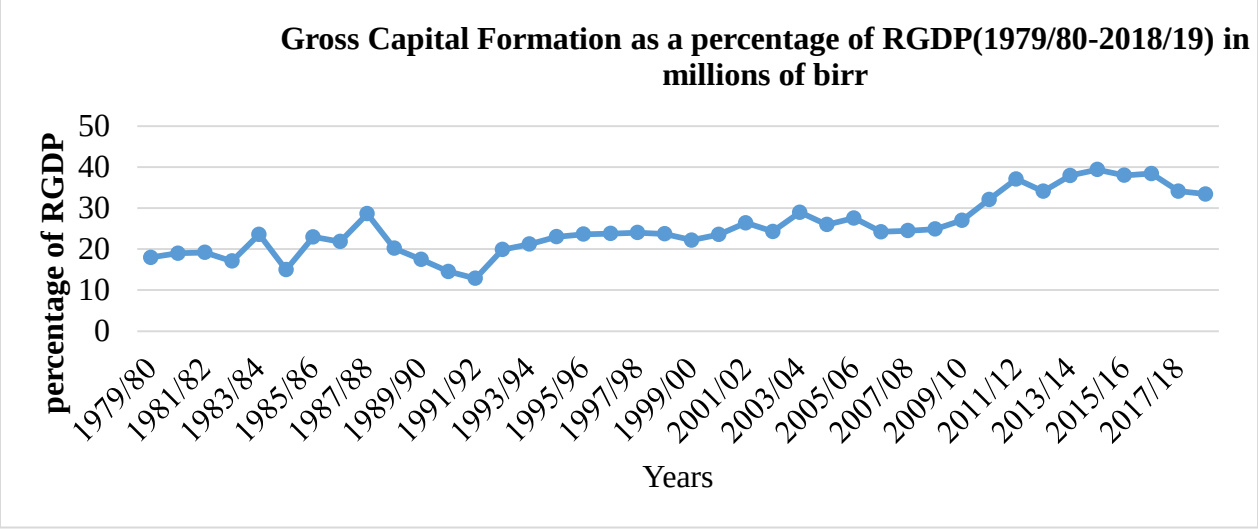
Figure 2: Trends of saving

As we have seen from the above figure 2, Ethiopia registered gross national savings as a percentage of real GDP from the period (1979/80-2018/19) on average values of 22.91%, on average values of gross national saving as a percentage of real GDP from the period in 1979/80-

1990/91(the last Twelve years of the Derg regime) is 16.81%, the minimum being 11.62%(1984/85) due to this period was catastrophic draught and famine in which GDP and GDP per capita actually declined by 5.3 and 8.5 percent respectively with disastrous consequence for the economy and society(Tewodros,2015) and 10.04%(1990/91) due to this period was the last year of the Derg and the maximum was about 25.51%(1987/88) due to this period was the period of recovery in the regime as a result of best rain season. To sum up, the gross national saving as a percentage of real GDP is low during the Derg regime is due to a civil war in the country, subsistence economy of the nation, where gross consumption expenditure consist a lion share of GDP. Low per capita income and low propensity to save are also the reason for lower saving in the country in general.

On average values of from the period, 1991/92-2018/19 is 25.53%, the minimum is 12.56% (1991/92) since it was the transition period from Derg to EPRDF and stood at 32.4% of real GDP in 2018/19. This shows in recent years associated with the remarkable recent economic growth and relatively stable political and macroeconomic environment the gross national saving ratio seems to be stable. Therefore, it can be traced from the above graph of gross national saving ratio that the gross national saving ratio fluctuates in the range of 10% to 32% throughout the study period.

4.2.2. Trends of Investment



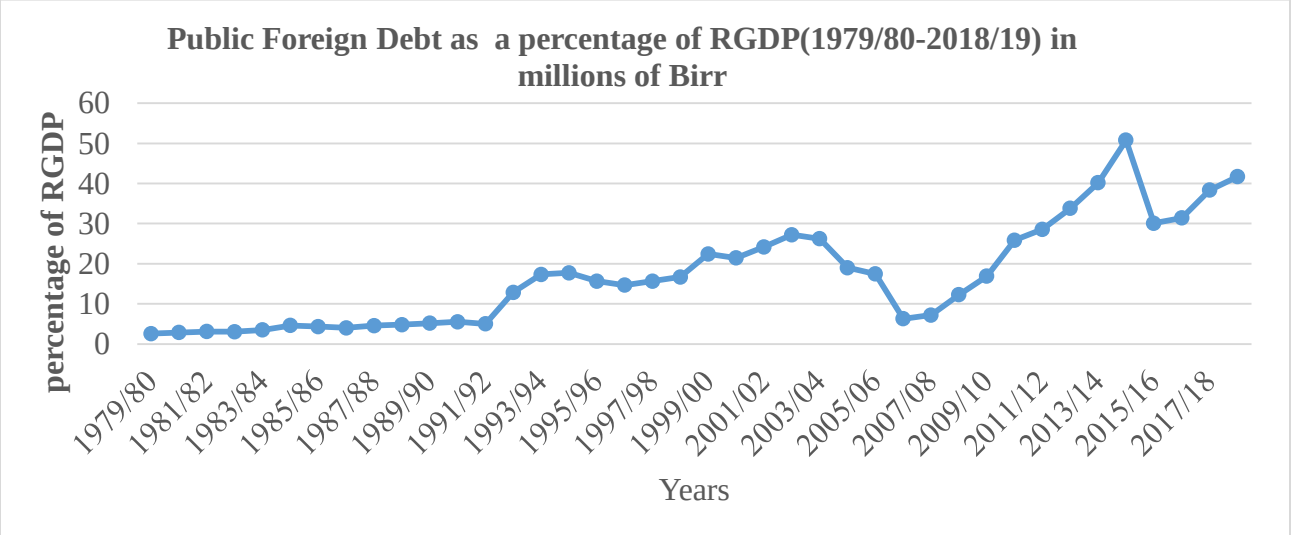
Source: Own drawing using NBE (2021)

Figure 3: Trends of Investment

As we have seen from the above figure 3, Ethiopia registered gross capital formation as a percentage of real GDP from the period (1979/80-2018/19) on average values of 25.35%, on average values of gross capital formation as a percentage of real GDP from the period in 1979/80-1990/91(the last Twelve years of the Derg regime) is 19.79%, the minimum being 14.98% (1984/85) because of a big draught in Ethiopia and 14.56% (1990/91) and the maximum was about 28.63% (1987/88). On average values of gross capital formation as a percentage of real GDP from the period in 1991/92-2018/19(under EPRDF) is 27.73%, the minimum being 12.87% (1991/92) and the maximum was 39.42% (2014/15). The reason why the gross capital formation as a percentage of real GDP is low during the Derg regime is political instability, where considerable share of recurrent expenditure and GDP were allocated for military expenses. However, in post Derg periods the gross capital formation shows significant improvement.

4.2.3. Trends of Public Foreign Debt

The Ethiopian public external debt stock has shown significant change in its size over consideration under the year. Its external debt is steadily increasing since 2006/07. According to Ministry of Finance Debt Management Directorate (2019), the Ethiopian public foreign debt reached 781900 million of birr or 41.71 percent of real GDP during 2018/19 from 21108 million of birr or 6.28 percent in 2006/07.while national saving and investment registered 606549.7 and 627055 million of birr or 32.35 and 33.45 percent for the same period from 92239.3 and 81345.9 million of birr or 27.46 and 24.22 percent in 2006/07.



Source: Own drawing using NBE (2021)

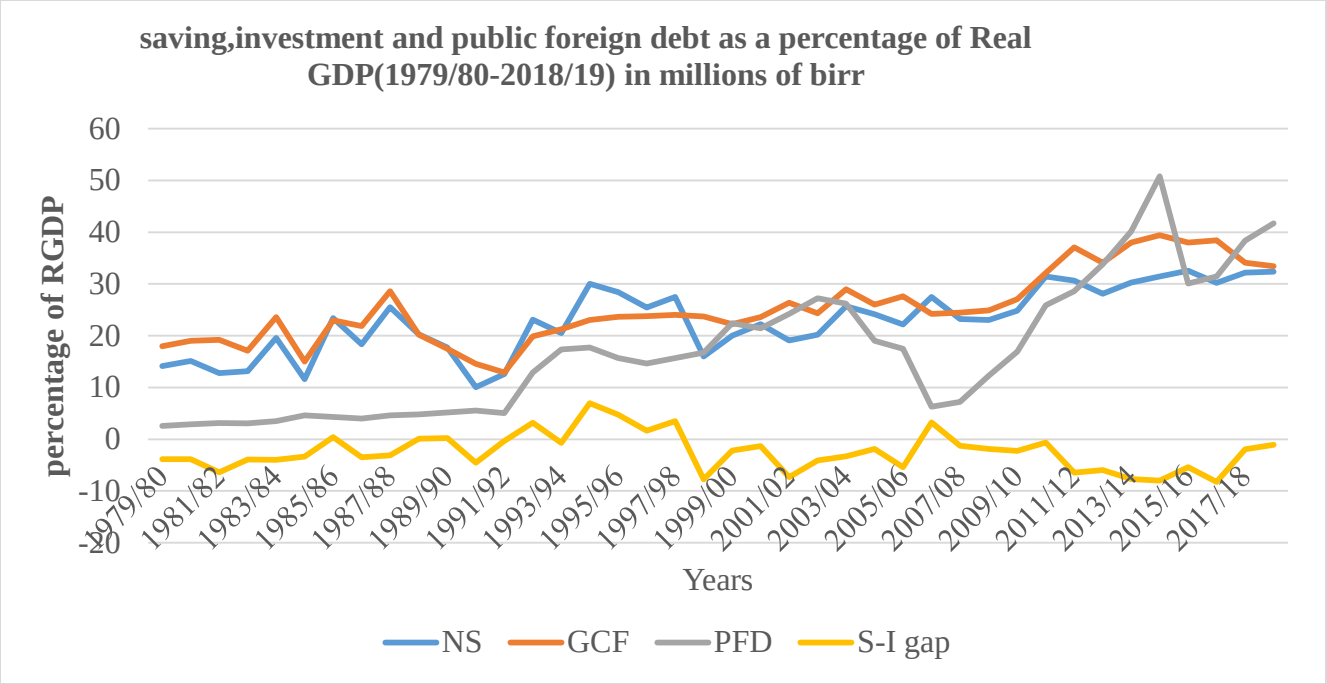
Figure 4: Trends of Public Foreign Debt

As we have seen from the above figure 4, Ethiopia registered public foreign debt as a percentage of real GDP from the period (1979/80-2018/19) on average values of 17.14%, on average values of public foreign debt as a percentage of real GDP from the period in 1979/80-1990/91(the last Twelve years of the Derg regime) is 4.02%, the minimum being 2.59% (1979/80) and the maximum was about 28.63% (1987/88). On average values of public foreign debt as a percentage of real GDP from the period in 1991/92-2018/19(under EPRDF) is 22.76%, the minimum being 5.03 % (1991/92) because this year was the transition period between Derg and EPRDF and 6.29% (2006/07) the maximum was 50.79% (2014/15).

During the military power, the country had shown dependency on external assistance and reached a stage where it cannot function without external assistance (Befekadu and Birhanu, 1999/00) as cited in Wosene (2014).but savings and investment registered 16.81 and 19.79 percent. During EPRDF regime to 2018/19, saving and investment registered on average 25.53 and 27.73 percent. This low saving and investment during Derg regime may be associated with high external debt burden of which 40-50 percent financed for military expense (Tadesse, 2011). In the other hand, Haile Mariam (2011) stated that, Ethiopia is one of the Highly Indebted Poor Countries (HIPCs) in the world. As we have seen figure 4 above, the public foreign debt continually at increasing rate since 2006/07, the economy also grew at an average of double digit (11.4 percent), saving and investment also grew at an average of 29.06 and 32.72 percent for the same period. from this we can observe that the public foreign debt increases, the saving and investment also raises, which indicated that the public foreign debt were invested in the macro economic development rather for recurrent consumption hence public external debt has positive relationship with savings and investment.

4.2.4. Trends of Saving, Investment, Public foreign debt and resource gaps

In bid to achieve sustained economic growth and in the process development, Ethiopia has launched big investment project planes. Therefore, it is clear that the role of gross national saving in financing investment requirements has been well documented. However, gross national saving is unable to cover all the investment requirements.



Source: Own drawing using NBE (2021)

Figure 5: Trends of Savings, Investment and Public Foreign Debt

As we have seen from the above Figure 5, in 1991/92, the public foreign debt, national saving and gross capital formation as a percentage of real GDP are 5.03, 12.56 and 12.87 percent, in 2014/15, the public foreign debt, national savings and investment as a percentage of RGDP are 50.78, 31.42 and 39.41 percent, hence we observe that public foreign debt increasing, saving and gross capital formation also increasing. Hence, public foreign debt has a positive effect on both savings and investment in Ethiopia under this period of study. In addition, the resource gap (saving-investment gap) for the above figure fluctuates over time shows there is a widening gap of saving and investment hence public foreign debt is necessary to fill these resource gaps.

4.3. Unit Root Test

Testing for existing of unit root is the major interest in the study of time series models and co integration. The presence of unit root is the time series is non-stationary whereas the absence of a unit root shows the stochastic process is stationary. Thus, we have performed the tests for examining the stationary of the data. In the ARDL model, the presence of I (2) variables are no valid because ARDL models are based on the assumption that the variables are either I (0) or I (1) or mixture of both. Therefore, the implementation of unit root test in ARDL procedure is necessary

in order to ensure that none of the variables is integrated order two or more. The Augmented Dickey Fuller (ADF) test is conducted to check the order of integration of the variables.)

Table 3: Augmented Dickey -Fuller (ADF) unit root test

Variables	Included test equation	ADF unit root testing at levels					ADF unit root testing at first differences				
		ADF test statistics at level	P value at level	ADF critical value at level			ADF test statistics at 1st difference	P value at 1st difference	ADF critical value at 1st differences		
				1%	5%	10%			1%	5%	10%
Log NS	Intercept	-3.924	0.042*	-3.6156	-2.941	-2.609	-8.255012	0.0000			
	Trend and Intercept	-4.846	0.0019*	-4.2119	-3.53	-3.196	-8.511869	0.0000			
Log GCF	Intercept	1.268742	0.998	-3.6156	-2.941	-2.609	-7.267969	0.0000**	-3.615588	-2.941145	
	Trend and Intercept	-1.627212	0.7637	-4.2119	-3.53	-3.196	-4.985274	0.0015**	-4.243644	-3.544284	
Log PFD	Intercept	0.317352	0.9763	-3.6105	-2.939	-2.608	-5.157573	0.0001**	-3.615588	-2.941145	
	Trend and Intercept	-2.208064	0.4717	-4.2191	-3.533	-3.198	-5.167067	0.0008**	-4.219126	-3.533083	
Log PFDS	Intercept	0.398296	0.9804	-3.6105	-2.939	-2.608	-6.193164	0.0000**	-3.615588	-2.941145	
	Trend and Intercept	-0.904725	0.9453	-4.2119	-3.53	-3.196	-6.314732	0.0000**	-4.219126	-3.533083	
Depir	Intercept	-2.018211	0.2781	-3.6105	-2.939	-2.608	-5.329293	0.0001**	-3.615588	-2.941145	
	Trend and Intercept	-1.871098	0.6502	-4.2119	-3.53	-3.196	-5.295184	0.0006**	-4.219126	-3.533083	
Leir	Intercept	-1.940405	0.3111	-3.6105	-2.939	-2.608	-6.708304	0.0000**	-3.615588	-2.941145	
	Trend and Intercept	-2.442251	0.3534	-4.2119	-3.53	-3.196	-6.616027	0.0000**	-4.219126	-3.533083	
Log RGDP	Intercept	2.445433	1	-3.6105	-2.939	-2.608	-5.136756	0.0001**	-3.615588	-2.941145	
	Trend and Intercept	-0.473767	0.9807	-4.2119	-3.53	-3.196	-4.866087	0.0002**	-4.234972	-3.540328	
GRGDP	Intercept	-5.428717	0.0001*	-3.6156	-2.941	-2.609	2.411768	0.0000			
	Trend and Intercept	-6.260455	0*	-4.2191	-3.533	-3.198	0.547715	0.0000			

Note:

- ✓ Akaike information criterion (AIC) is used to determine the lag length.*and ** indicates MacKinnon (1996) one-sided p-values at level and rejection of null hypothesis of non-stationary based on p values decision criterion.
- ✓ The variables Growth rate of real GDP(GRGDP) and gross national savings(LogNS) are stationary at levels, which are already known stationary at 1st differences

Source: output from Eviews 10 from own computations NBE data

The above Table 3 shows unit root results of the series at levels and at first differences. If p- value is less than 5 % (0.05), our decision is we reject the null hypothesis i.e. the null hypothesis is there is a unit root (not stationary) and the alternative hypothesis is there is no unit root (stationary). Reject the null hypothesis is meaning that we accept the alternative hypothesis and the series is stationary. Therefore, from the above table the variable Growth rate of real GDP (GRGDP) and gross national savings (LogNS) are stationary at levels. Hence GRGDP is stationary for all included test (p value = 0.0001 is less than 0.05 at intercept and p value = 0 is less than 0.05 at trend and intercept) and LogNS is stationary for all included test (p value = 0.042 is less than 0.05 at intercept and p value = 0.0019 is less than 0.05 at trend and intercept. if the variables are not stationary at levels, there should be checked at first differences and should be stationary at first differences. Hence the results of ADF unit root test in table 3 shows, Gross capital formation (Log GCF), public foreign debt (Log PFD), public foreign debt servicing (Log PFDS), interest rate on bank deposit (Depir), lending interest rate (Leir) and real Gross Domestic Product (RGDP) are stationary at 1^{st} differences. There is no variable stationary on second differences i.e. I (2)) and such result of the ADF unit root test is one justification for using the ARDL approach (bounds test approach of co-integration) developed by Pesaran, Shin, and Smith (2001). Any presence of I (2) variable in the model will render the methodology invalid.

In nutshell, the results are a mixture of I(0) and I(1) at intercept and trend and intercept, which is a clear indication to use ARDL modeling and bounds testing in order to examine the long-run association between variables.

4.4. Optimal lag length selection

In this study, Akaike information criterion (AIC) is used to determine the optimal lag length of each variable automatically because it is a better choice for small sample size data. Moreover, according to Pesaran and Shin (1999), for the annual data the number of lag is typically small, 1 or 2 then chose the optimal lag length, which have the smallest values of Akaike information criterion (AIC).hence the smallest values of AIC for the optimal lag in this study is 1.

Table 4: Optimal lag length for saving equation

VAR Lag Order Selection Criteria

Endogenous variables: LOGNS DEPIR LOGRGDP LOGPFD LOGPFDS

Exogenous variables: C

Sample: 1 40

Included observations: 38

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-45.66039	NA	9.90e-06	2.666336	2.881808	2.743000
1	91.70345	231.3496*	2.71e-08*	-3.247550*	-1.954719*	-2.787571*
2	106.6711	21.26982	4.94e-08	-2.719532	-0.349341	-1.876236

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 5: Optimal lag length for investment equation

VAR Lag Order Selection Criteria

Endogenous variables: LOGGCF LEIR GRGDP LOGPFD LOGPFDS

Exogenous variables: C

Sample: 1 40

Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-247.3309	NA	0.577059	13.63951	13.85720	13.71626
1	-125.1896	204.6692*	0.003069*	8.388628*	9.694778*	8.849107*
2	-107.6623	24.63303	0.004970	8.792556	11.18716	9.636767

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Therefore, as we have seen the above table 5 and 6, the optimal lag length at which the smallest values of Akaike information criterion -3.247550 in saving equation and 8.388628 in investment equation is 1. Then in this paper, a maximum lag length of one was chosen for the conditional ARDL model. Finally in this model, AIC selects the optimal lag length of each variable when the dependent variable is national saving and the respective independent variables that is (Log NS, Depir, Log RGDP, Log PFD, Log PFDS) respectively and it is ARDL (1,0,1,0,0) and the dependent variable is Gross capital formation and the respective independent variables that is (Log GCF, Leir, GRGDP, Log PFD, Log PFDS) and it is ARDL (1,0,0,0,0). This automatically determination of the lag length is to get the valid result and inferences.

4.5. Long run ARDL bounds test for co integration

After we determined the stationary nature of the variables and determine the appropriate optimal lag length by using Akaike information criterion (AIC), the next task is the bound test approach of co-integration is estimating ARDL model. As we have seen from the above optimal lag length selection, we used the maximum lag length 1 for this paper. In addition to this, we have also used AIC to determine the optimal lag because it is a better choice for smaller sample size data as this study. Apart from this, AIC found to produce the least probability of under estimation among all criteria available (Liew V. and Khimsen A. 2004) as cited in Tsadkan (2013). The computed F statistic value is compared with the lower and upper bound critical values provided by Pesaran et al. (2001) and Narayan (2005).

Table 6: bound test for co-integration analysis in saving equations (Log NS)

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.569345	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Own result (2021) using Eviews 10

Table 7: bound test for co-integration analysis in investment equations (Log GCF)

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	6.614528	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Own result (2021) using Eviews 10

Table 8: The upper and Lower critical values with restricted intercept and no trend

Critical value	Narayan (2005)	
	Lower bound value	Upper bound value
1%	3.967	5.455
5%	2.893	4.00
10%	2.427	3.395

Source: Narayan (2005) table for critical values for the bounds test: case II: restricted intercept and no trend

The critical values reported for Narayan (2005) are the case with restricted intercept and no trend (case II). In this study we have been used Narayan (2005) which is developed based on 30 to 80 observations as we discussed earlier. As we see in Table 7 and 8 above, with an intercept and no trend, the calculated F statistic from table 7 in saving equation 4.569345 is higher than Narayan (2005) upper bound critical values at 5% and 10% level of significance and the calculated F statistic from table 8 in investment equation 6.614528 is higher than Narayan (2005) upper bound critical values at 1%, 5% and 10% level of significance. This implies that the null hypothesis of no long-run relationship is rejected; rather accept the alternative hypothesis (there is long-run relationship) based on Narayan (2005) critical values at 5% and 10% level of significance in saving equation and 1%, 5% and 10% level of significance in investment equation. Therefore, there is co-integration relationship among the variables in long run.

4.6. Long run ARDL model estimation

After confirming the existence of long run relationship among log of Gross national saving, interest rate on bank deposit, log of real gross domestic product, log of public foreign debt and log of public foreign debt servicing on saving equations and log of gross capital formation, interest rate on bank advance, growth rate of real gross domestic product, public foreign debt and public foreign debt servicing on investment equation, the next critical step is running the appropriate ARDL model to find out the long run coefficients, which is reported in table 10 and 11 below.

Table 9: estimated long run coefficients using ARDL approach ARDL (1, 0, 1, 0, 0) for saving equation

Dependent variable is Log NS				
Variables	Coefficients	Standard error	t-statistic	Probability
Depir	0.012686	0.010744	1.180798	0.2464
Log RGDP	1.035355	0.162283	6.379920	0.0000*
Log PFD	0.174629	0.080663	2.164931	0.0380*
Log PFDS	-0.069306	0.090288	-0.767617	0.4483
Constant(C)	-1.494923	0.608455	-2.456918	0.0196*

Note:* denotes significance at 5%, which indicates rejection of null hypothesis at 5%

Source: Own result (2021) using Eviews 10

Table 10: estimated long run coefficients using ARDL approach ARDL (1, 0, 0, 0, 0) for investment equation

Dependent variable is Log GCF				
Variables	Coefficients	Standard error	t-statistic	Probability
Leir	-0.016985	0.031375	-0.541334	0.5919
GRGDP	0.015473	0.007465	2.072808	0.0461**
Log PFD	0.760661	0.272623	2.790155	0.0087**
Log PFDS	-0.107311	0.274570	-0.390834	0.6984
C	1.919827	0.449619	4.269898	0.0002**

** indicates the 5% level of significance level.

Source: Own result (2021) using Eviews 10

The result of the above table 10 and 11 indicates that all the variables entered in the regression have the expected signs regardless of their significant level. As we have discussed in the theoretical and empirical literature parts, interest rate for bank deposits, real gross domestic product, public foreign debt have positive effect while public foreign debt servicing has an inverse effect on Ethiopian national savings regardless of significant. Also, growth rate of real gross domestic product and public foreign debt have positive effect while public foreign debt servicing and interest rate for bank advances have inverse effect on Ethiopian investment regardless of significant.

The saving and investment equations are specified in a log linear form; hence, the coefficient of the dependent variables can be interpreted as elasticity with respect to saving and investment. As we observe the long run ARDL regression result (see table 10 and 11), log of public foreign debt has a significant and positive relationship with both log of gross national savings and log of gross capital formation. It is implied that public foreign debt has had positive contribution to national saving and investment in Ethiopia. The coefficient of log public foreign debt (log PFD) 0.175 from table 10 in saving equation indicates a one percent increase in public foreign debt, holding other things constant, leads to a 0.175 percentage increase in gross national savings. It is inconsistent with a study made by Moreputla and Moffat (2017) for Botswana National saving.

the coefficient of log public foreign debt (log PFD) 0.761 from table 11 in investment equations indicates a one percent increase in public foreign debt, holding other things constant, leads to a 0.761 percentage increase in gross capital formation. This indicates the absence of debt overhang problem in the country.

This significant positive relationship of public foreign debt with both savings and investment implies the economy of developing countries in general and particularly in Ethiopia is low; levels of national savings and domestic investment also low. Therefore, it is useful to public foreign debt to increase the levels of productivity and savings in Ethiopia. The other reason of significant positive relationships of public foreign debt with investment is that most of the foreign debt of Ethiopia is for building infrastructure projects and productive capital projects. This may increase the stock of capital formation. On the other hand, for the positive relationship of public foreign

debt with savings and investment, it can be justified that due to higher financial inflow in terms of foreign currency, more funds would be available to be saved and invested in the economy.

In Ethiopian, debt to GDP ratio is not so high (Habtu, 2018), and a significant portion of it is soft loan with low interest rate. Besides, loan funds are usually used for productive investment projects essential for private investment such as physical and human capitals which justify the finding in this regard. Based on these results, we concluded that public foreign debt itself does not have any significant adverse effect on national saving and investment efforts. This study's result is consistence of study of Chaudhry et al., (2009) for their study of impact of external debt on savings and investment in Pakistan, Teklu et al., (2014) for their study of public external debt, capital formation and economic growth in Ethiopia, Habtu(2018) for his study of analysis on the determinants of private investment in Ethiopia.

This finding also in line with the reasoning of Eaton (1993), if the debt obtained is to be invested, theoretically, it is expected that the marginal product of capital is higher than the world interest rate for developing countries and then, such countries would benefit from external borrowing. According to Eaton , the impact of external debt is likely dependent on where the fund is assigned rather than on "how much fund is borrowed ''implying that the government's commitment which intern depends on the country's institutional set up is what matters the most in determining the impact of external debt stock on savings and investment.

In addition, log of real gross domestic product has positive and significant effect on log of gross national savings and Growth rate of real gross domestic product has positive and significant effect on log of gross capital formation. This indicates that real GDP and growth rate of real GDP has had positive contribution on savings and investment in Ethiopia. The coefficient of log of real Gross Domestic Product (log RGDP) 1.04 from the above table 10 in saving equation indicates a one percent increase in real Gross Domestic Product, holding other things constant, leads to increase gross national saving by 1.04 percent. The coefficient of growth rate of real Gross Domestic Product (GRGDP) 0.02 from the above table 11 in investment equation indicates a one percent increase in growth rate of real Gross Domestic Product, holding other things constant, leads to increase gross capital formation by 0.02 percent. This result is consistent with the findings of Sidrat et al (2013) for their study of determinants of national savings in Pakistan

Public foreign debt servicing (PFDS) has negative but insignificant effect on both savings and investment in Ethiopia. We should note that public foreign debt servicing includes both the payment of amortization (liquidation of the principal) and accumulated interest. Ethiopia is a developing country and its saving and investment gap is filled by the foreign debt .Hence Foreign debt servicing has a negative relationships' with national savings and gross capital formation through its adverse effects on net factor income from abroad even if it is insignificant. This insignificant effect indicates there is no crowding out effect of public foreign debt servicing on savings and investment in Ethiopia. That is servicing of public foreign debt burden on the current resources, there by adversely affecting national saving and investment efforts.

On the other hand, Interest rate on bank deposits (Depir) has positive but insignificant effect on savings. This finding is in line with the finding of Agarwal (2001) for his study of the saving behavior of seven Asian countries and according to his study, most of the countries have shown insignificant impact of interest rate on savings and interest rate on bank advance (Leir) has negative but insignificant effect on gross capital formation.

4.6. Dynamic short run error correction estimates

After the acceptance of long-run coefficients of the saving and investment equations, the short run error correction model is estimated. The error correction term (ECT), as we discussed in chapter three, indicates the speed of adjustment to restore equilibrium in the dynamic model. It is a one lagged period residual obtained from the estimated dynamic long run model. The coefficient of the error correction term indicates how quickly variables converge to equilibrium. Moreover, it should have a negative sign and statistically significant at a standard significant level (i.e. p-value should be less than 0.05)

Table 11: The short run error correction representation for the selected ARDL (1, 1, 1, 1, 1) model for saving equations selected based on Akaike Information Criterion:

ECM Regression

Case 3: Unrestricted Constant and No Trend

Dependent variable is D(logNS)

Regressors	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.423996	0.268604	-5.301476	0.0000*
D(DEPIR)	0.002551	0.011514	0.221515	0.8262
D(LOGPFD)	0.132765	0.126704	1.047832	0.3034
D(LOGPFDS)	-0.070507	0.095170	-0.740851	0.4647
D(LOGRGDP)	1.433490	0.279109	5.135955	0.0000*
ect(-1)*	-0.888569	0.167838	-5.294195	0.0000*

Table 12: The short run error correction representation for the selected ARDL (1,1,1, 1, 1) model for investment equations selected based on Akaike Information Criterion

ECM Regression
Case 3: Unrestricted Constant and No Trend
Dependent variable is D(LOGGCF)

Regressors	Coefficient	Std. Error	t-Statistic	Prob.
C	0.451642	0.094341	4.787356	0.0000*
D(GRGDP)	0.003308	0.000650	5.091183	0.0000*
D(LEIR)	-0.004566	0.007661	-0.596027	0.5559
D(LOGPFD)	0.283996	0.103562	2.742283	0.0105*
D(LOGPFDS)	-0.003809	0.072582	-0.052480	0.9585
ect(-1)*	-0.208383	0.045398	-4.590163	0.0001*

Source: Own result (2021) using Eviews 10 result

The short-run ARDL estimate above table 12 and 13 indicates that, unlike that of the long-run analysis in saving equations, public foreign debt (DLOGPFD) is insignificant and it does not have any effect on national savings, but in investment equation, public foreign debt (DLOGPFD) has positive and significant effect on both long run and short run analysis on investment equations. This short run positive coefficient of public foreign debt (DLOGPFD) 0.28 in in investment equation indicates a one percent increase in public foreign debt, holding other things constant,

leads to increase gross capital formation by 0.28 percent. This finding is in line with the finding of Habtu (2018), but contradicts with Teklu et al., (2014).

Like long run analysis, real gross domestic product (D log RGDP) has positive and significant effect on national savings and growth rate of real gross domestic product (DGRGDP) has positive and significant effect on investment equations. These can be interpreted as a one percent increase in real gross domestic product, holding other things constant, leads to increase gross national savings by 1.43 percent and a one-unit increase in growth rate of real Gross domestic product, holding other things constant, leads to increase investment by 0.003 percent.

Also like long run analysis, public foreign debt servicing (DLOGPFDS) has negative and insignificant effect on national saving and investment in Ethiopia. On the other hand, like long run analysis, Interest rate on bank deposits (Depir) has positive but insignificant effect on savings and interest rate on bank advance (Leir) has negative but insignificant effect on gross capital formation in short run

The speeds of adjustment of any disequilibrium towards long-run equilibrium or the equilibrium error correction coefficient (ECM), estimated (-0.888569) in saving equations and (-0.208383) in investment equations is highly significant and has the correct sign. It implies a very high speed of adjustment to equilibrium after a shock. Approximately 88.86 and 20.84 percent of the disequilibrium from the previous year's shock converges back to the long run equilibrium in the current year and such highly significant error correction term is another proof for the existence of a stable a long-run equilibrium relationship among the variables.

4.7. Pair wise Granger causality results

To identify the direction of the causality between the dependent variable (log NS) and the targeted independent variables interest rate on bank deposits (Depir),real gross domestic product (log RGDP), public foreign debt (log PFD) and public foreign debt servicing (log PFDS)in saving equation and the dependent variable(log GCF) and the targeted independent variables interest rate on bank advances (Leir), growth rate of real gross domestic product(GRGDP), public foreign debt(log PFD) and public foreign debt servicing (log PFDS) in investment equation and which of the variables granger cause the others are seen the following table 14 and 15.

Table 13: ARDL Granger causality test results in saving equation

Null Hypothesis:	F-Statistic	Prob.
DEPIR does not Granger Cause LOGNS	0.02712	0.8701
LOGNS does not Granger Cause DEPIR	0.45733	0.5032
LOGRGDP does not Granger Cause LOGNS	10.2449	0.0029*
LOGNS does not Granger Cause LOGRGDP	0.50033	0.4839
LOGPFD does not Granger Cause LOGNS	7.02964	0.0118*
LOGNS does not Granger Cause LOGPFD	1.04318	0.3139
LOGPFDS does not Granger Cause LOGNS	4.34478	0.0443*
LOGNS does not Granger Cause LOGPFDS	4.35756	0.0440*

Source: Own result (2021) using Eviews 10

As we have seen from the results of ARDL Granger causality test in saving equation above table 14, it can be understood that the null hypothesis that interest rate for bank deposit (DEPIR) does not granger cause national savings (LOGNS) is not rejected because the probability value 0.8701 is more than 5%(0.05) level of significance and national savings (LOGNS) does not granger cause interest rate for bank deposit (DEPIR) is not rejected because their probability value 0.5032 is more than 5% level of significance. This shows that interest rate for bank deposit cannot affect national savings and national saving cannot affect interest rate for bank deposit.

The null hypothesis real gross domestic product (LOGRGDP) does not granger cause national saving (LOGNS) is rejected at 5% level of significance because the probability value 0.0029 is less than 5%(0.05) and the null hypothesis national saving (LOGNS) does not granger cause real gross domestic product (LOGRGDP) is not rejected at 5% level of significance because the probability values 0.4839 is greater than 5% level of significance. Therefore, there is a unidirectional causal relationship from real gross domestic product to national saving and it implies that real gross domestic product cause only for national saving change but national saving cannot cause real gross domestic product to change.

The null hypothesis that public foreign debt (log PFD) does not granger cause national savings (logNS) is rejected at 5% significance level. There is a unidirectional causal relationship from

stock of public foreign debt to national savings and this is consistent with the long run regression results. It implies that public foreign debt can cause only for national saving change but national saving cannot cause public foreign debt to change. On the other hand, there is bidirectional causal relationship from public foreign debt servicing to national saving and from national saving to public foreign debt servicing. This implies that public foreign debt servicing can cause national saving change and national saving can cause public foreign debt servicing to change.

Table 14: ARDL Granger causality test results in investment equations

Null Hypothesis:	F-Statistic	Prob.
LEIR does not Granger Cause LOGGCF	0.41697	0.5225
LOGGCF does not Granger Cause LEIR	1.36364	0.2506
GRGDP does not Granger Cause LOGGCF	0.03942	0.8438
LOGGCF does not Granger Cause GRGDP	5.18311	0.0290*
LOGPFD does not Granger Cause LOGGCF	3.67350	0.0632
LOGGCF does not Granger Cause LOGPFD	0.59555	0.4453
LOGPFDS does not Granger Cause LOGGCF	1.18047	0.2845
LOGGCF does not Granger Cause LOGPFDS	5.06855	0.0306*

Source: Own result (2021) using Eviews 10

As we have seen from the ARDL Granger causality test in investment equations above table 15, it can be understood that the null hypothesis that interest rate for bank advances (LEIR) does not granger cause gross capital formation (LOGGCF) is not rejected at 5% level of significance because the probability value 0.5225 is greater than 5% (0.05) and gross capital formation (LOGGCF) does not granger cause interest rate for bank advances (LEIR) is not rejected at 5% level of significance because the probability value 0.2506 is more than 5% level of significance. This shows that interest rate for bank advances cannot affect gross capital formation and gross capital formation cannot affect interest rate for bank advances.

The null hypothesis growth rate of real gross domestic product (GRGDP) does not granger cause gross capital formation (LOGGCF) is rejected at 5% level of significance because the probability value 0.0029 is less than 5%(0.05) and the null hypothesis gross capital formation (LOGGCF)

does not granger cause growth rate of real gross domestic product (GRGDP) is not rejected at 5% level of significance because the probability values 0.4839 is greater than 5% level of significance. Therefore, there is a unidirectional causal relationship from growth rate of real gross domestic product to gross capital formation and it implies that growth rate of real gross domestic product cause only for gross capital formation change but gross capital formation cannot cause growth rate of real gross domestic product to change.

The null hypothesis that public foreign debt (log PFD) does not granger cause gross capital formation (LOGGCF) is not rejected at 5% significance level because the probability value 0.0632 is more than 5%(0.05) and gross capital formation (LOGGCF) does not granger cause public foreign debt is not rejected at 5% level of significance because the probability value 0.4453 is more than 5%(0.05). This shows that public foreign debt does not affect gross capital formation and gross capital formation does not affect public foreign debt.

On the other hand, the unidirectional relationship between Gross capital formation and public foreign debt servicing implies that gross capital formation causes only for public foreign debt servicing change but public foreign debt servicing cannot cause gross capital formation to change. This is consistent with the findings of study by Abdulahi et al., (2016) for Nigeria's Gross capital formation.

4.8. Diagnostic Tests

Testing robustness of the model is performed using the diagnostic test. To check the reliability and verifiability of the estimated long run and short-run models, diagnostic tests are undertaken. These tests include Normality (Jaque-Bera test), serial correlation (Brush and God fray LM test), Heteroscedasticity (Breusch-Pagan-Godfrey test) and also CUMSUM recursive residuals and CUMSUM square recursive residuals tests are applied to check the overall stability of the long-run and short-run coefficients which are recommended by Pesaran et al. (2001).

4.8.1. Normality tests

Figure 6 and 7 represents the results of normality test for saving and investment equations

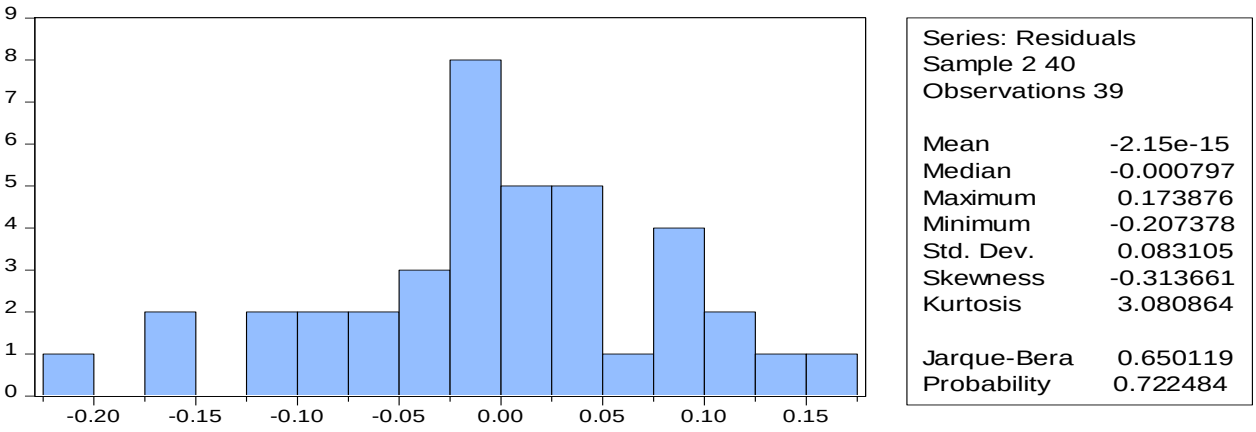


Figure 6: results of normality test for saving equations

To ascertain that the residuals in the model are normally distributed in the above figure 6 in results of saving equations, the normality test was conducted. The test uses the Jarque-Bera statistic, which has a chi-square distribution and operates under the null hypothesis of normally distributed residuals. Hence the null hypothesis of the Jarque-Bera normality test which says that the residuals are normally distributed is failed to reject, for the reason that the p- value associated is larger than the standard significance level(0.72>0.05). Therefore, the error terms are normally distributed.

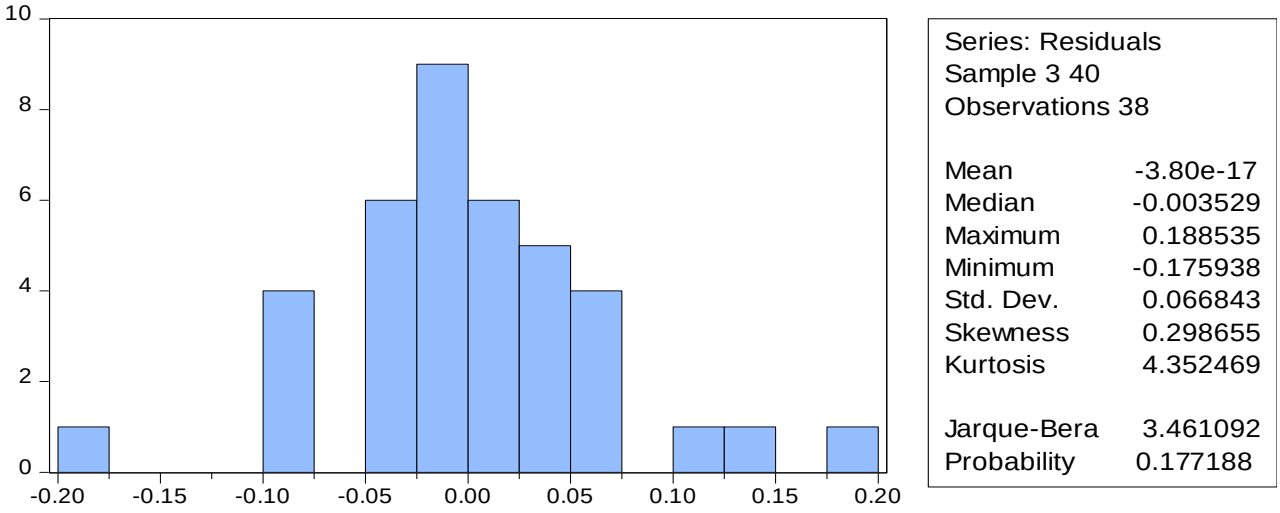


Figure 7: results of normality test for investment equations

Similarly in the above figure 7 results of normality test in investment equations ,we could not reject the null hypothesis for the Jarque-Bera normality test which says that the residuals are normally distributed, for the reason that the p-value associated is larger than the standard significance level (0.18>0.05). Therefore, the error term is normally distributed.

4.8.2. Serial correlation test

The Breusch-Godfrey serial correlation test was also used to test for serial correlation. This test operates under the null hypothesis of no serial correlation.

Table 15: results of serial correlation test for saving equations

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.257050	Prob. F(1,28)	0.6161
Obs*R-squared	0.354777	Prob. Chi-Square(1)	0.5514

From the above results of serial correlation test of saving for table 16, The null hypothesis of no serial correlation (Brush and God fray LM test) is failed to reject for the reason that that the p-value associated with test statistic is greater than the standard significant level (0.55> 0.05)

Table 16: results of serial correlation test for investment equations

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.638473	Prob. F(5,23)	0.1898
Obs*R-squared	9.980323	Prob. Chi-Square(5)	0.0758

From the above results of serial correlation test of investment equations for table 5.6,The null hypothesis of no serial correlation (Brush and God fray LM test) is failed to reject for the reason that that the p-value associated with test statistic is greater than the standard significant level (0.076> 0.05).

4.8.3. Heteroscedasticity test

Table 17: results of heteroscedasticity test in saving equations

Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.227531	Prob. F(9,29)	0.3170
Obs*R-squared	10.75873	Prob. Chi-Square(9)	0.2926
Scaled explained SS	6.189300	Prob. Chi-Square(9)	0.7208

We can understand from the results of heteroscedasticity test in saving equations for table 18, the null hypothesis of no heteroscedasticity is failed to be rejected at 5% significant level due to its p-value associated is greater than the standard significance level(0.293>0.05).

Table 18: results of heteroscedasticity test in investment equations

Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.048324	Prob. F(9,28)	0.4287
Obs*R-squared	9.577335	Prob. Chi-Square(9)	0.3858
Scaled explained SS	8.716222	Prob. Chi-Square(9)	0.4639

We can understand from the results of heteroscedasticity test in investment equations for table 19, the null hypothesis of no heteroscedasticity is failed to be rejected at 5% significant level due to its p-value associated is greater than the standard significance level(0.3858>0.05).

4.8.4. Stability test

The cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) of recursive residuals were also used to test for parameter stability. As depicted in the following figure 8 and 9 for the results of cumulative sum of saving and investment equations, the parameters appear to be stable over time at 5% significance level, as the cumulative sum did not go beyond the area between the critical lines in both cases.

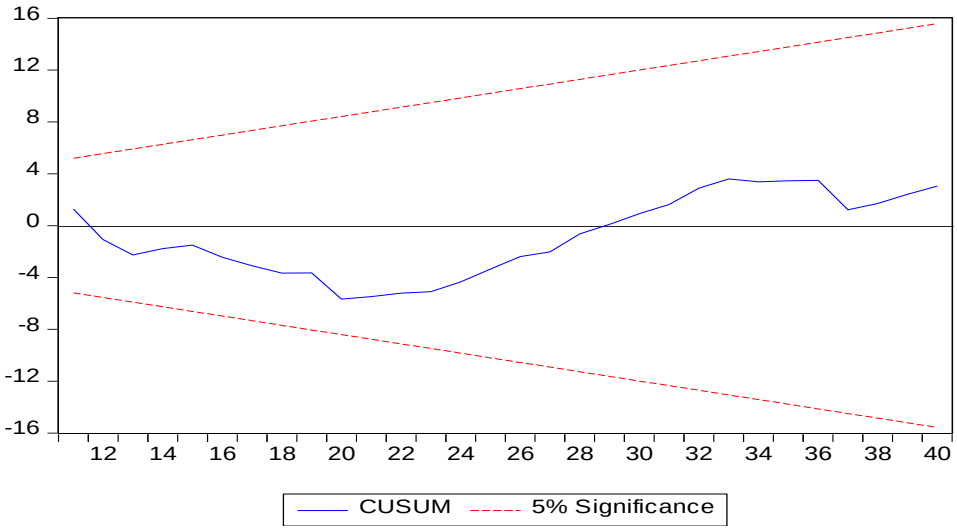


Figure 8: plot of cumulative sum of recursive residuals in saving equations

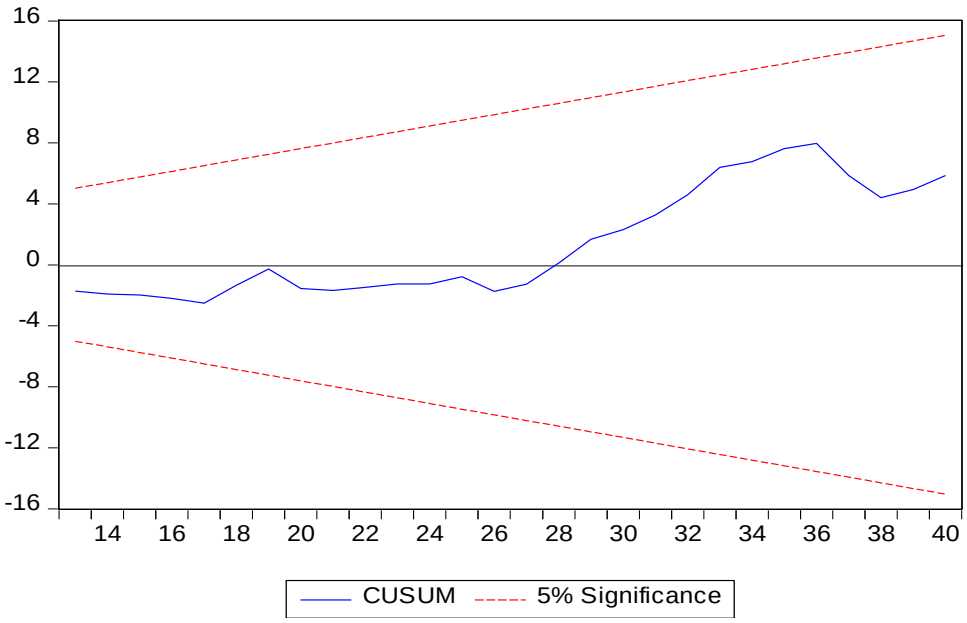


Figure 9: plot of cumulative sum of recursive residuals in investment equations

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

The underlying objective of this study was to empirically establish the effect of public foreign debt on savings and investment and their causality in Ethiopia. Time series data covering a period of 40 years from 1979/80 to 2018/19 was used. The variable investment was proxy by gross capital formation as a percentage of real Gross domestic products whilst public foreign debt was represented by public foreign debt as a percentage of real gross domestic products. The study also incorporated other covariates (which include interest rate on bank deposits, real gross domestic product and public foreign debt servicing in saving equations and lending interest rate, growth rate of real gross domestic product and public foreign debt servicing in investment equations) in the model as guided by the related empirical and theoretical literature. Before providing the empirical findings, the study reviewed both theoretical and empirical literature surrounding issues of public foreign debt, public foreign debt servicing, national savings and investment.

Stationarity of the variables was established before estimating the model to avoid spurious results and guide on the type of model to be used for estimation. Results from the Augmented Dickey Fuller (ADF) test indicated that the variables were stationary at levels (LogNS and GRGDP) and at first differences (Depir, Leir, LogRGDP, Log PFD, Log GCF and Log PFDS). hence there are a mixed of order of co-integration. The ARDL model was therefore estimated from which both the short run and long run equations were estimated. Diagnostic tests were also conducted to ascertain the reliability of the model estimation and accuracy of the economic interpretations made. Results from these diagnostic tests indicated that there was no presence of serial correlation and heteroscedasticity. In addition, the residuals were normally distributed, and the estimated parameters were stable over time.

From the ARDL model estimation results, public foreign debt was found to be positively related and statistical significance to national savings in the long run and positive related and insignificance in short run whereas, public foreign debt was found to be positively related and significance to investment both in the long run as well as the short run.

The short run dynamic ARDL regression results also reveals that, the speed of adjustment of any disequilibrium towards a long run equilibrium or the equilibrium error correction coefficient estimated(-0.88569 in saving equation and -0.208383 in investment equation) is highly significant suggesting about 88.56 percent in saving equations and 20.84 percent in investment equations annual adjustment towards long run equilibrium. It implies a very high speed of adjustment to equilibrium after a shock. Furthermore, a part from the long run and short run regression results the causality test results indicate that there is a significant a uni-directional causal relationship from public external debt to savings and there is no causal relationships from public foreign debt to investment in Ethiopia.

5.2. RECOMMENDATIONS

Based on the above results the following recommendations were made:-

- The study therefore, recommends that external borrowing should be channeled to the real sectors of the economy against social consumption to be felt in the economy
- The government should play fundamental part in stimulating the country if the resources gained from the debt relief initiatives are applied at productive investment and social expenses for the poor in the country.
- The funds should be managed properly in order to avoid wastages and mismatch. In addition, measures that would prevent the diversion of the funds should be instituted.
- Introducing effective external debt management policy is crucial to remove miss-utilization of resources.
- Policies that encourage domestic investments, foreign direct investment and increased trade earnings can be effective in rising GDP growth and reducing dependence on external debt for sustained economic development.

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APPENDICES

Appendix 1: Critical values for the bounds test: Case II: restricted intercept and no trend

1 per cent																
	$k=0$		$k=1$		$k=2$		$k=3$		$k=4$		$k=5$		$k=6$		$k=7$	
n	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
30	7.595	7.595	6.027	6.760	5.155	6.265	4.614	5.966	4.280	5.840	4.134	5.761	3.976	5.691	3.864	5.694
35	7.350	7.350	5.763	6.480	4.948	6.028	4.428	5.816	4.093	5.532	3.900	5.419	3.713	5.326	3.599	5.230
40	7.220	7.220	5.593	6.333	4.770	5.855	4.310	5.544	3.967	5.455	3.657	5.256	3.505	5.121	3.402	5.031
45	7.265	7.265	5.607	6.193	4.800	5.725	4.270	5.412	3.892	5.173	3.674	5.019	3.540	4.931	3.383	4.832
50	7.065	7.065	5.503	6.240	4.695	5.758	4.188	5.328	3.845	5.150	3.593	4.981	3.424	4.880	3.282	4.730
55	6.965	6.965	5.377	6.047	4.610	5.563	4.118	5.200	3.738	4.947	3.543	4.839	3.330	4.708	3.194	4.562
60	6.960	6.960	5.383	6.033	4.558	5.590	4.068	5.250	3.710	4.965	3.451	4.764	3.293	4.615	3.129	4.507
65	6.825	6.825	5.350	6.017	4.538	5.475	4.056	5.158	3.725	4.940	3.430	4.721	3.225	4.571	3.092	4.478
70	6.740	6.740	5.157	5.957	4.398	5.463	3.916	5.088	3.608	4.860	3.373	4.717	3.180	4.596	3.034	4.426
75	6.915	6.915	5.260	5.957	4.458	5.410	4.048	5.092	3.687	4.842	3.427	4.620	3.219	4.526	3.057	4.413
80	6.695	6.695	5.157	5.917	4.358	5.393	3.908	5.004	3.602	4.787	3.351	4.587	3.173	4.485	3.021	4.350
5 per cent																
30	5.070	5.070	4.090	4.663	3.538	4.428	3.272	4.306	3.058	4.223	2.910	4.193	2.794	4.148	2.730	4.163
35	4.945	4.945	3.957	4.530	3.478	4.335	3.164	4.194	2.947	4.088	2.804	4.013	2.685	3.960	2.597	3.907
40	4.960	4.960	3.937	4.523	3.435	4.260	3.100	4.088	2.893	4.000	2.734	3.920	2.618	3.863	2.523	3.829
45	4.895	4.895	3.877	4.460	3.368	4.203	3.078	4.022	2.850	3.905	2.694	3.829	2.591	3.766	2.504	3.723
50	4.815	4.815	3.860	4.440	3.368	4.178	3.048	4.002	2.823	3.872	2.670	3.781	2.550	3.708	2.457	3.650
55	4.795	4.795	3.790	4.393	3.303	4.100	2.982	3.942	2.763	3.813	2.617	3.743	2.490	3.658	2.414	3.608
60	4.780	4.780	3.803	4.363	3.288	4.070	2.962	3.910	2.743	3.792	2.589	3.683	2.456	3.598	2.373	3.540
65	4.780	4.780	3.787	4.343	3.285	4.070	2.976	3.896	2.750	3.755	2.596	3.677	2.473	3.583	2.373	3.519
70	4.750	4.750	3.780	4.327	3.243	4.043	2.924	3.860	2.725	3.718	2.564	3.650	2.451	3.559	2.351	3.498
75	4.760	4.760	3.777	4.320	3.253	4.065	2.946	3.862	2.725	3.718	2.574	3.641	2.449	3.550	2.360	3.478
80	4.725	4.725	3.740	4.303	3.235	4.053	2.920	3.838	2.688	3.698	2.550	3.606	2.431	3.518	2.336	3.458
10 per cent																
30	4.025	4.025	3.303	3.797	2.915	3.695	2.676	3.586	2.525	3.560	2.407	3.517	2.334	3.515	2.277	3.498
35	3.980	3.980	3.223	3.757	2.845	3.623	2.618	3.532	2.460	3.460	2.331	3.417	2.254	3.388	2.196	3.370
40	3.955	3.955	3.210	3.730	2.835	3.585	2.592	3.454	2.427	3.395	2.306	3.353	2.218	3.314	2.152	3.296
45	3.950	3.950	3.190	3.730	2.788	3.540	2.560	3.428	2.402	3.345	2.276	3.297	2.188	3.254	2.131	3.223
50	3.935	3.935	3.177	3.653	2.788	3.513	2.538	3.398	2.372	3.320	2.259	3.264	2.170	3.220	2.099	3.181
55	3.900	3.900	3.143	3.670	2.748	3.495	2.508	3.356	2.345	3.280	2.226	3.241	2.139	3.204	2.069	3.148
60	3.880	3.880	3.127	3.650	2.738	3.465	2.496	3.346	2.323	3.273	2.204	3.210	2.114	3.153	2.044	3.104
65	3.880	3.880	3.143	3.623	2.740	3.455	2.492	3.350	2.335	3.252	2.209	3.201	2.120	3.145	2.043	3.094
70	3.875	3.875	3.120	3.623	2.730	3.445	2.482	3.310	2.320	3.232	2.193	3.161	2.100	3.121	2.024	3.079
75	3.895	3.895	3.133	3.597	2.725	3.455	2.482	3.334	2.313	3.228	2.196	3.166	2.103	3.111	2.023	3.068
80	3.870	3.870	3.113	3.610	2.713	3.453	2.474	3.312	2.303	3.220	2.303	3.154	2.088	3.103	2.017	3.052

Appendix 2: Long run ARDL model estimation for saving equations result

Levels Equation

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEPIR	0.012686	0.010744	1.180798	0.2464
LOGPFD	0.174629	0.080663	2.164931	0.0380
LOGPFDS	-0.069306	0.090288	-0.767617	0.4483
LOGRGDP	1.035355	0.162283	6.379920	0.0000
C	-1.494923	0.608455	-2.456918	0.0196

EC = LOGNS - (0.0127*DEPIR + 0.1746*LOGPFD -0.0693*LOGPFDS +
1.0354*LOGRGDP -1.4949)

Appendix 3: Long run ARDL model estimation for investment equations result

Levels Equation

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GRGDP	0.015473	0.007465	2.072808	0.0461
LEIR	-0.016985	0.031375	-0.541334	0.5919
LOGPFD	0.760661	0.272623	2.790155	0.0087
LOGPFDS	-0.107311	0.274570	-0.390834	0.6984
C	1.919827	0.449619	4.269898	0.0002

EC = LOGGCF - (0.0155*GRGDP -0.0170*LEIR + 0.7607*LOGPFD -0.1073
*LOGPFDS + 1.9198)

Appendix 4: short run error correction estimates results for saving equations

ECM Regression

Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.423996	0.268604	-5.301476	0.0000
D(DEPIR)	0.002551	0.011514	0.221515	0.8262
D(LOGPFD)	0.132765	0.126704	1.047832	0.3034
D(LOGPFDS)	-0.070507	0.095170	-0.740851	0.4647
D(LOGRGDP)	1.433490	0.279109	5.135955	0.0000
CointEq(-1)*	-0.888569	0.167838	-5.294195	0.0000

Appendix 5: short run error correction estimates results for investment equations

ECM Regression

Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.451642	0.094341	4.787356	0.0000
D(GRGDP)	0.003308	0.000650	5.091183	0.0000
D(LEIR)	-0.004566	0.007661	-0.596027	0.5559
D(LOGPFD)	0.283996	0.103562	2.742283	0.0105
D(LOGPFDS)	-0.003809	0.072582	-0.052480	0.9585
CointEq(-1)*	-0.208383	0.045398	-4.590163	0.0001

Appendix 6: ARDL Granger causality test results in saving equation

Null Hypothesis:	Obs	F-Statistic	Prob.
DEPIR does not Granger Cause LOGNS	39	0.02712	0.8701
LOGNS does not Granger Cause DEPIR		0.45733	0.5032
LOGRGDP does not Granger Cause LOGNS	39	10.2449	0.0029
LOGNS does not Granger Cause LOGRGDP		0.50033	0.4839
LOGPFD does not Granger Cause LOGNS	39	7.02964	0.0118
LOGNS does not Granger Cause LOGPFD		1.04318	0.3139
LOGPFDS does not Granger Cause LOGNS	39	4.34478	0.0443
LOGNS does not Granger Cause LOGPFDS		4.35756	0.0440
LOGRGDP does not Granger Cause DEPIR	39	0.30514	0.5841
DEPIR does not Granger Cause LOGRGDP		0.09569	0.7588
LOGPFD does not Granger Cause DEPIR	39	0.28963	0.5938
DEPIR does not Granger Cause LOGPFD		0.34196	0.5623
LOGPFDS does not Granger Cause DEPIR	39	0.99730	0.3246
DEPIR does not Granger Cause LOGPFDS		2.21046	0.1458
LOGPFD does not Granger Cause LOGRGDP	39	2.35922	0.1333
LOGRGDP does not Granger Cause LOGPFD		2.38687	0.1311
LOGPFDS does not Granger Cause LOGRGDP	39	0.78027	0.3829
LOGRGDP does not Granger Cause LOGPFDS		6.03908	0.0189
LOGPFDS does not Granger Cause LOGPFD	39	1.28617	0.2642
LOGPFD does not Granger Cause LOGPFDS		2.04939	0.1609

Appendix 7: ARDL Granger causality test results in investment equation

Null Hypothesis:	Obs	F-Statistic	Prob.
LEIR does not Granger Cause LOGGCF	39	0.41697	0.5225
LOGGCF does not Granger Cause LEIR		1.36364	0.2506
GRGDP does not Granger Cause LOGGCF	38	0.03942	0.8438
LOGGCF does not Granger Cause GRGDP		5.18311	0.0290
LOGPFD does not Granger Cause LOGGCF	39	3.67350	0.0632
LOGGCF does not Granger Cause LOGPFD		0.59555	0.4453
LOGPFDS does not Granger Cause LOGGCF	39	1.18047	0.2845
LOGGCF does not Granger Cause LOGPFDS		5.06855	0.0306
GRGDP does not Granger Cause LEIR	38	1.73041	0.1969
LEIR does not Granger Cause GRGDP		0.69230	0.4110
LOGPFD does not Granger Cause LEIR	39	3.57903	0.0666
LEIR does not Granger Cause LOGPFD		0.54742	0.4642
LOGPFDS does not Granger Cause LEIR	39	3.82861	0.0582
LEIR does not Granger Cause LOGPFDS		0.42358	0.5193
LOGPFD does not Granger Cause GRGDP	38	6.24170	0.0173
GRGDP does not Granger Cause LOGPFD		0.03249	0.8580
LOGPFDS does not Granger Cause GRGDP	38	5.53705	0.0244
GRGDP does not Granger Cause LOGPFDS		0.12982	0.7208
LOGPFDS does not Granger Cause LOGPFD	39	1.28617	0.2642
LOGPFD does not Granger Cause LOGPFDS		2.04939	0.1609