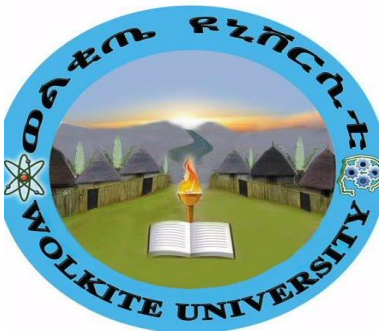

WOLKITE UNIVERSITY

COLLEGE OF BUISNESS AND ECONOMICS

DEPARTEMENT OF ECONOMICS

NEXUS AMONG INTEREST RATE, DOMESTIC SAVING, INVESTMENT AND ECONOMIC GROWTH IN ETHIOPIA

BY: MESAY TESHOME ROBA

WOLKITE, ETHIOPIA

JUNE, 2021

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A RESEARCH PAPER SUBMITTED TO THE DEPARTMENT OF ECONOMICS FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF MASTRATE DEGREE IN ECONOMICS (MAJOR IN DEVELOPMENT ECONOMICS)

BY: MESAY TESHOME ROBA

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WOLKITE, ETHIOPIA

JUNE, 2021

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.

Name: _____

Signature: _____

Date of submission: _____

SCHOOL OF GRADUATE STUDIES

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(Submission Sheet-1)

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 Mesay Teshome), 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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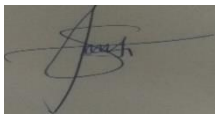

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Date:

_____ _____ _____

Name of co-advisor: Lemma Shallo (MSc) Signature Date:

Name _____ Signature _____ Date_____

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EXAMINERS' APPROVAL SHEET-2

(Submission Sheet-2)

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 Mesay Teshome under the title **"Nexus Among Interest Rate, Domestic Saving, Investment and Economic Growth in Ethiopia"** 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

ARDL	Auto Regressive Dock Fuller Lag
CSA	Central Statistical Agency
GDP	Gross Domestic Product
EXP	Export
LCM	Life Cycle Model
MoFEC	Ministry of Finance and Economic Cooperation
NA	National Account
NBE	National Bank of Ethiopia
NS	National Saving
OLS	Ordinary Least Square
PIH	Permanent Income Hypothesis
PP	Phillips-Perron
SDG	Sustainable Development Goal
SIC	Shwarz Information Criteria
RGDP	Real Gross Domestic Product
RIH	Relative Income Hypothesis
SDPRP	Sustainable Development Poverty Reduction Program
WB	World Bank

US United States

VAR Vector Auto Regressive

VECM Vector Error Correction Model

ABSTRACT

In this study, the relationship between Interest Rate, Domestic Saving, Investment and Economic Growth in Ethiopia 1981/82 to 2019/20 is tested empirically. The study was employed a modern econometrics technique such as, unit root test, lag selection criteria, cointegration test. The descriptive analysis found that in the study period the average value of their fluctuation interval of Interest Rate, Saving, and Investment and other control variables. The ADF and PP unit root test was employed. All the variables used in this study were found to be stationary in their first difference. Long-run relationship among variables confirmed through Johnson co-integration analysis whereas the short-run dynamics observed by VECM specification. From the finding interest rate and inflation have negative and significant effect on economic growth. National Saving (NS) is statistically significant and positive relationship with explaining economic growth in the long run and the lagged investment has a positively significant effect on economic growth The positive sign of Saving and Investment shows that the long-run impact on Economic growth. However, from the long run relationship between economic growth and lagged Interest rate was found to be negative. Saving and Investment have unidirectional causality running from economic growth to Investment and Saving, the vice versa is not true. For the case of Ethiopia, investment play a major role in contributing to economic growth; the investment increase in a country in short or in long run have major effect. This implies that the conventional wisdom that higher level of investment leads to economic growth affect positively in Ethiopia. The economic growth with respect to lagged labor force, gross capital formation and inflation was found to be positive in the long run impact on Economic growth, finally the study recommends that invest more in saving and investment rather than increasing interest rate.

Key word: *Interest Rate, Domestic Saving, Investment, Economic Growth, Co-integration, Vector Error Correction Model, Grange causality, Ethiopia*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The shortest path of development has still remained to be mysterious despite success of some countries. Many countries in the developing world are still trying to search for the root that helps to traverse their population from living in abject state of life. Although it does not necessarily ensure all-embracing improvements in the life of every person, economic growth is necessary condition for the eradication of poverty at a country level. In turn, since economics started emerging as independent discipline during the era of mercantilists and Adam smith, accumulation of wealth, (which is nothing but saving) has been identified as a key variable for growth. Saving, with necessary enabling environment is easily converted in to investment or capital and enables labor and other resources to be effectively mobilized for the growth of overall level of an economy (Worku 2011).

The pioneerin terms of clearly establishing the link between saving and economic growth was Harrods (1939), who was later followed by omer (1946). The two pioneer development economists lent for the well-known Harrod and Domar model. These two economists, Solow (1956) and Romer (1986) underscored the importance of saving as it translates itself into investment and stimulate economic growth. According to the neo-classical school led by Robert Solow, an increase in the saving rate brings about a shift in a steady state growth path although its effect is transitory because of diminishing marginal productivity of capital. The endogenous growth theorists argue that an increase in the rate of saving will have a sustained and permanent effect on economic growth because of increasing returns to scale (World Bank, 1994). The 1990s have seen a resurgence of interest in themes of economic growth and development. This is certainly a welcome change from the last decade and a half, during which macroeconomics was dominated by a concern- with short-term adjustment and stabilization issues, leaving

largely aside the basic problems of growth, capital accumulation and saving generation (World Bank, 1994)

The advent of endogenous growth (Barro and Sala-i-Martin, 2004) has encouraged research on the transmission channels of FDI on economic growth in the long run. According to neoclassical growth models, the long-run growth in per capita income is zero or equal to the rate of technical progress, which is exogenous. The FDI can affect economic growth only in the short term on conditions that the marginal productivity of capital decreases, the host economy converges to a steady-state and the FDI has no permanent impact on economic growth. It is only through permanent technology shocks that FDI affects economic growth of the host country (Anis Omri, et al, 2013)

Athukorala and Sen (2004) also argue against the perception of the globalization of capital that domestic investment is fundamentally determined by domestic saving and thus high rate of national saving is a crucial determinant of economic growth. There is cross-country evidence which supports the hypothesis that long-run growth rate of income is significantly determined by domestic investment rate and domestic saving rate (Levine and Renelt, 1992), Otani and Villanueva (1990) found a similar result. Loayza et. al. (2000) also finds a strong and positive relationship between the national saving rate and the level of income of countries. If there is causality between the two, the policy implication is that domestic saving should be increased to finance domestic investment, finance imported capital goods and there by achieve sustainable economic growth. However, the relationship between income level and saving rate in poor countries might be influenced by considerations of subsistence consumption, which is more than inter-temporal consumption smoothing (Easterly, 1994 and Ogaki et.al., 1996). Saving rate and GDP may go in the same direction, which association may not necessarily indicate causality.

Moore (2006), The empirical evidence against the established view that saving is a necessary prerequisite for growth. The researches provide a theoretical framework to show that saving cannot be a constraint for growth. Financial markets operate properly and flow of capital across countries, it doesn't save for investment. Even if the argument

saving vs. investment and economic growth has been still been unsettled, the question of what determines saving is also a source of theoretical and empirical debate.

The life cycle model (LCM), the permanent income hypotheses (PIH) and the relative income hypothesis (RIH) are widely used as a benchmark to organize the arguments about the consumption and saving behavior of households. The Life cycle model (LCM) assumes that economic agents make sequential decisions to achieve a coherent goal using the currently available information as best they can (Browning and Crossley, 2001). Utility maximizing agents postpone part of their current consumption and save it for consumption during retirement in a dynamic and uncertain environment. The PIH argues that consumption expenditure closely follows permanent income, instead of current income of economic agents as hypothesized by Keynesian economists. Modigliani (1986) in his RIH argues that the share of life time resources that households plan to devote to bequests is an increasing function of their life time resources relative to others in the same age cohort.

This means that economic growth depends on investment through private savings and capital accumulation (Mohamed, 2014). The evaluation of the impact of savings and investment on economic growth in Nigeria is very important because it will provide useful information on which of the macro-economic variables will be used to monitor the level of economic growth through savings and investment. The major problem of this study is to know whether or not the traditional view of growth that gross domestic savings and gross domestic investment promotes economic growth is valid? This is because the level of economic growth may itself affect the savings and investment rate. Barro (1991) and Romer (1990) stated that human capital investment and labor force also plays a special role in economic growth. Human capital investment and labor force are the key input which generates new ideas that leads to faster economic growth. Human capital investment is an important source of long-term economic growth (Mohamed, 2014).

Savings and investment has been considered as two critical macro-economic variables with micro-economic foundations for achieving price stability and promoting

employment opportunities there by contributing to sustainable economic growth. However, inadequate savings and investments are common problem in developing countries. For instance Ethiopia average domestic savings to GDP ratio has been lower than that of the SSA average in real terms (Dawit, 2004). The average GDS to GDP ratio in real terms for the Ethiopia had been 9.7%in the 1990s and 6.4% for the period 2000-08 which is lower than the corresponding average GDS to GDP ratio for SSA (Tassew, 2011). Poor performance of economy, high unemployment level, engagement of a large proportion of the population in the informal sector and low wage are factors responsible for low domestic saving in small developing states. (Shimelis Kebede, 2014)

1.2. STATEMENT OF THE PROBLEM

The issue of savings and investment is certainly not new but their implications on economic growth has had mixed results in both developing and developed countries. We all know that economic growth of any nation requires investment which can be financed through private savings.

Savings naturally plays an important role in the economic growth and development process. Savings determines the national capacity to invest and thus to produce, which in turn, affect economic growth potential of the country. Low saving rates have been cited as one of the most serious constraints to sustainable economic growth. Whether savings and investment cause economic growth or get caused by economic growth has been a serious theoretical as well as empirical debate among researchers. In classical theory, an increase in savings and investment will lead to an increase in the output (Ramakrishna and Rao, 2012).

Piotr Misztal (2011), the correlation between savings and economic growth in advanced economies and in emerging and developing economies are generally consistent with economic growth theories. From the point of view of a standard theory of economic growth, positive cause and effect relation between domestic savings and economic growth may appear in advanced economies, in which quite high domestic savings may constitute an essential source of financing domestic investment and an economic growth

factor, without the necessity of using foreign investment. For the same reason, in the poorest countries there should not be any relation between domestic savings and economic growth, as these countries, in order to finance their investment, use mostly foreign savings as their domestic savings are quite scarce.

Investment is very essential to mobilize human and natural resource to more productive, effective and efficient utilization of available resource by allocating them in investment activity. It consists of goods bought for future use. Investment is also divided in to three sub categories: business fixed investment, residential fixed investment, and inventory investment. Business fixed investment is the purchase of new plant and equipment by firms. Residential investment is the purchase of new housing by households and landlords. Inventory investment is the increase in firms' inventories of goods (if inventories are falling, inventory investment is negative (Mankiw, 2000).

In Ethiopia's private saving was lower in the Derg regime than the imperial era since it was above 10 percent before 1974 as compared to below 4 percent for the years 1973/74-1990/91. Despite its recovery in 1989/90, it fell again consistently and became negative for the year 1992/93. This is in spite of the introduction of a new interest rate structure which resulted in positive real interest rate (WB, 2013).

Klaus Schmidt et al., (1996), The empirical evidence about virtuous circles of heavy saving and investment and rapid growth, the relationship between the three is complex, with causality running in several directions. Still, saving often seems to follow, rather than precede, investment and growth, contrary to the Mill- Marshall-Solow interpretation - Investment and innovation are the centerpieces of growth. In this regard, the new literature on growth represents a decided (if unintended) return to the tradition initiated by Marx, Schumpeter, and Keynes. The result of the regression indicates that change in gross domestic savings movements has negative and significant effect on the change in economic growth in Nigeria and that the change in gross domestic investment has positive and significant effect on the change in the Nigerian economic growth. (Nwanne, T. F. I. 2014).

Therefore, gross domestic savings in Ethiopia is a very critical and reliable factor in capital formation process. The relationship between interest rate, domestic savings and investment has significant implications on the state of the economy. For example, if the results of causality test indicate that saving precedes and causes economic growth, then government and policy makers can design or employ policies that would promote the mobilization of saving in order to achieve higher economic growth. Although the relationship between saving and economic growth is an important one, the direction of causality between the variables has continued to generate series debate controversies among scholars. Nevertheless, the determination of the direction of the causal link between saving and growth is a crucial economic problem as it has important policy implications for developing countries like Ethiopia. This research focused on examining the causal relationship between interest rate, national savings, investment and economic growth in Ethiopia that is to put light on how interest Rate, national saving, and investment affects Economic Growth.

Thus, there are few studies that have been conducted on the relationship between interest rate, national saving, investment and economic in developing countries in general and in Ethiopia in particular. However, addressing interest rate, national saving, investment has a paramount support our country in giving policy recommendation and suggestion toward the issue of interest rate, national saving, investment and economic growth by looking at data from MOFEC, Ethiopian statistics agency and National Bank of Ethiopia from 1980/1981 to 2019/20 through econometrics analysis. Most of the previous studies conducted about the relationship between domestic saving and investment on economic growth, but in this include the interest rate.

Hence, to best knowledge of the researcher, there are no studies that have been conducted in Ethiopia on this title. Furthermore, this study will contribute to the existing paucity of the literature by examining the relationship between economic growth and interest rate, national saving, investment and its causality in Ethiopia.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this study was to analyze the relationship between interest rate, national saving, investment and economic growth, and their causality in Ethiopia by using time series data from 1981 to 2019

1.3.2. Specific Objective

- To see the trends and patters of interest rate, national saving, investment and economic growth in Ethiopia
- To investigate the short run and long run relationship between interest, national saving, investment and economic growth in Ethiopia
- To identify causal relationship between interest, national saving, investment and economic growth in Ethiopia

1.4. Research Hypothesis

H01: There is no relationship between interest rate, national saving, investment and Economic growth in Ethiopia

H11: There is a relationship between interest rate, national saving, investment and Economic growth in Ethiopia

H02: There is no short run and long run relationship between interest rate, national saving, investment and Economic growth in Ethiopia

H12: There is a short run and long run relationship between interest rate national saving, investment and Economic growth in Ethiopia

H_{03}: There is no any causal relationship between interest rate, national saving, investment and Economic growth in Ethiopia

H_{13}: There is causality between interest rate, national saving, investment and Economic growth in Ethiopia.

1.5. Significance of the Study

Knowledge of the extent to which national saving, investment and interest rate impacts on economic growth is a principal agenda to both the policy makers and to the academicians. The findings of this study what believed to provide a useful contribution to the empirical basis needed for proper understanding of the previous routes as well as give emphasis for future process on saving issue. The study also adds value to the stock of knowledge by showing the relationship between interest rate, national saving, investment and economic growth in the Ethiopian economy.

1.6. Scope and limitation of the Study

The scope of this study limit in terms of coverage and method. With regard to coverage, it was limited to evaluate Ethiopian economy. The study period covers from 1981/1982 to 2019/20.

The time and financial constraints were that affect the research work. The research was under some constraint in trying to investigate this study among them to related literature found in the library are not in Ethiopian context that has using as a secondary source, lack of finance and sufficient internet service for further information.

CHAPTER TWO

2. LITERATURE REVIEW

The first chapter introduced the problem to be investigated in this study along with purpose and research hypothesis. In order to put the study within the context of the existing literature, the subsequent section of this chapter present the review of both theoretical and empirical studies related to interest rate, national saving, investment and economic growth.

2.1. Theoretical Literature Review

Theories of Economic Growth and Savings In this part provides the important relationship between saving and growth based on the well-known Classical economic growth models of Solow-swan.

Saving is a provision for future consumption for the individual households and a source of capital accumulation for the economy at large. (Singh, 2009) conducted a study in India based on time serious data and found the significant impact of saving on income, these saving contributed for domestic investment to grow and accelerates capital accumulation which leads to the economy to grow. based on this study most of these saving comes from the surplus domestic household saving sector which finance the deficit private and public sector and fills the resource gap. (Abu, 2010) studied the relationship between savings and economic growth in Nigeria using Granger Causality techniques and Co-Integration for the period 1970 to 2007. His results indicate that the variables are co-integrated in such a manner that one can conclude there is a long-run equilibrium relationship between them and that causality is from economic growth to savings. (Narayan, 2006) conducted a study based on autoregressive distributed lag modeling approach for Japan over the period 1960–1999.

2.1.1. The (closed-economy) Solow-swan

According to (Solow, 1956) model saving rate influence the steady state level of economy and have an impact on growth rate of output temporarily. This model expresses the increases in the rate saving affects the level of capital stock and the level of per capital income however it doesn't affect the rate of economic growth. This model is constructed by the two equations which are the production and capital accumulation equation.

The production equation expresses how imputes (capital and labor) are combined and provides an output. This production function specified in the form of Cobb-Douglas production function. Mathematically label as

Y= f (k, l) = k res to alpha x l res to one minus alpha.

$Y(t) = AK(t)^{\alpha}L(t)^{\alpha-1}$ ….(2.1)

Where, 0 < α <1, Y is Output, K is capital, L is labour and A is technology. The assumption of diminishing returns implies that each additional investment project produces a smaller return until the point where the next project is not profitable.

2.1.2. The Endogenous Theory of Growth

To overcome the long-term effects of the Solow Model, human capital is introduced in to the theory. Human capital is not subject to diminishing return allowing growth to occur continuously at a rate of human capital accumulation. This addition into the growth theory changes very little, with foreign capital and policy distortions having the same impact in the short run. However, this endogenous model does drop the assumption of diminishing returns which allows for unbounded long-term growth. This is because non-diminishing returns to capital mean that the returns on investment projects will never equal the cost (depreciation) which allows for a profit on each subsequent investment (Romer and Lucas, et.al. 2004).

The Endogenous theory emphasis that, economic growth does not slow as capital accumulation, but the rate of growth depends on the type of capital a country invests in. As research indicates that increasing human capital (education) and technological change (innovation) fast economic growth in long run. This endogenous model, suggests equilibrium can be reached where continuous long-term growth exists. This means that foreign aid will increase growth well into the long run. The model states that growth is closely related to the level of human capital. Firms directly benefit from knowledge accumulation due to new innovations and designs that allow for greater productivity (Romer and Lucas, et.al. 2004).

In the endogenous growth setup, the role of externality that arises from research and development is considered as growth stimulant factor, unlike the neo-classical model. Therefore, new growth models acknowledge that policy measures could have significant impact on long run growth. Both H-D and Solow growth models, foreign capital is treated as a component of total saving. However, the Solow model argues that foreign capital is most productive when the country is poorest. To capture the macroeconomic complication associated with foreign capital, modern theories have extended their analysis to examine the influence of foreign capital inflows on several other variables. This includes examining the impact of capital inflows on saving, investment and economic growth (Bulir and Lane, 2002).

The first version of endogenous growth theory is present by AK theory, which did not make an explicit distinction between capital accumulation and technological progress. An early version of AK theory was produced by Frankel (1962), who argued that the aggregate production function can exhibit a constant or even increasing marginal product of capital. In the special case where the marginal product of capital is exactly constant, aggregate output (Y) is proportional to the aggregate stock of capital (K). Sustained growth in living standard is due to technical progress the rate of each progress is exogenous. Endogenous growth theory is a set of models in which the growth rate of productivity and living standards is endogenous Production function:

$$Y = A K \quad \text{..... (2.2)}$$

Where A is the amount of output for each unit of capital (A is exogenous and constant). According to AK theory, an economy's long-run growth rate depends on its saving rate. Investment (sY), Depreciation (δ K) and Equation of motion for total capital are given. The key difference between this model and Solow, marginal product of capital is constant here, diminishes in Solow. For example, if a fixed fraction **s** of output is saved and there is a fixed rate of depreciation, the rate of aggregate net investment is:

$K^* = s Y - \delta K$ ..... (2.3)

$\Delta K = s Y - \delta K$ ..... (2.4)

Divide through by K and use Y = AK to get

$\frac{\Delta y}{y} = \frac{\Delta k}{k} = sA - \delta$ ..... (2.5)

If **sA** >δ, then income will grow forever, and investment is the engine of growth. Here, the permanent growth rate depends on **s**. In Solow model, it does not.

Akshaya Kumar Mohanty (2017), Worku (2011) and Shimelis, K. H. (2014), Result from ARDL Bounds testing indicates that there exists co-integration among gross domestic saving, gross domestic investment and interest rate **is** positive and significant effect on economic growth of Ethiopia in short-run and long-run. For Ethiopia, GDP growth is positively and significantly determined by savings, money supply, and foreign capital flow. Foreign capital in-flow in the form of foreign aid and credit is found to have a statistically significant negative effect in the short run and direct effect in the long run-on domestic savings. Terms of trade (ToT) are found to have a statistically significant direct effect on savings, particularly in the long-term effect. (Hassen Beshir 2017)

2.2. Empirical Literature Review

The role of saving for economic growth has been widely discussed in various literatures. The researcher observing the empirical relationship between growth rates and saving rates in countries with different income group data. Based on neoclassical growth model

(R. Solow, 1956) suggested that savings affected the economic growth since higher savings led to capital accumulation, which in turn led to investment and finally to economic growth.

Saving has no influence on the long run growth of total and per capital output since capital deepening increase capital labor ratio and also increase the share of output to replace and keep the existing capital but it still positively affects the living standards permanently by increasing the steady state amount of stock of capital per worker which, in turn, allows an increase in output per worker in the long run. Thus, depreciation of capital may exceed net investments. A growing labor force may accelerate this condition because more workers need to be equipped with capital. In recent times, many empirical studies highlighted in varied role of private and public investments in growth process.

As sighted in (Dritsakis, 2002), (Khan and Kumar, 1997) argued that the effects of private and public investments on economic growth differ significantly, through private investment to be more productive than public one. (Nelson and Singh, 1994) confirmed that public investments on infrastructure have an important positive effect on economic growth over the period 1980-1990. Easterly and (Rebelo, 1993) assessed those public investments on transportation and communications are positively correlated to economic growth, while there were negative effects of public investments of state-owned businesses on economic growth.

The causal relationship between savings and investment has been widely discussed in the empirical literatures according to (Mason, 1988), based on a cross country comparison the study found that the positive (0.7) relation between domestic saving and gross domestic investment means that on average a one percent increase in domestic saving causes a 0.7 percent increase in investment. Recently (Jagadeesh, 2015) explored the relationship between savings and economic growth in his empirical study the data were stationary and co- integrated and showed that there is a significant relationship between savings and economic growth in Botswana. The results supported that saving rate positively or directly related to the GDP in this country.

Ciftcioglu and Begovic, (2010) used Hausman and LM tests to study the relationship between savings and investment in the sample of advanced economies of the Europe and found statistically significant evidence of saving and GDP growth. Which, reveals that the optimal econometric model, the panel estimation of the relationship between domestic saving rate and the growth rate of GDP for their sample of Central and East European countries. The study recommended that the economic growth and domestic saving rate are positively correlated for the sample of Central and East European countries over the sample period. Based on their study domestic savings have continued to be an important source of domestic investment which is ultimately the parameter that links savings to output growth. Domestic saving rate is positive and statistically significant at 5% level.

Sajid and Sarfaraz, (2008) analyzed the effect of savings on economic growth by using seasonal data for 1973 to 2003 in Pakistan. The authors assessed the causality relation between savings and economic growth by using co-integration techniques and a Vector Error Correction Model (VECM). Their results show that there is a one-way causal relationship from savings to economic growth. The long run results of this study show the importance of savings in investment creation for Pakistan. The short run results also indicate that there is a relation between domestic savings and GDP. The causality relation only runs from national savings to GDP in the short run. The short and long run results of this study confirmed the Keynesian view that saving is a function of income levels.

Aghion and Comin, (2009) used a cross-country panel regression, and estimates lagged saving on growth are significantly larger for poor than for rich countries. The average estimate of the effect of saving on growth for the sample of rich countries is zero. (Velma and Wilson, 2007) there is a unique equilibrium relationship between the level of saving and output. Indicates a one percent increase in saving is consistent with a 0.55 percent increase in output in long run equilibrium. This estimate is significant at the one percent level. This shows the close relationship between output and saving.

(Sajid and Sarfraz, 2008) used vector error correlation model and showed that in the long run savings causes Economic growth in the same study there is mutual short run causality between domestic Savings and GDP. (Caceres, 1995) was found that in sample of four

countries domestic savings apply a much larger impact on economic growth than external savings. These results indicate that mobilization of domestic Resources of financial, real, and human where lies the key for countries development.

Mohan, (2006) investigated the causality relationship between savings and economic growth in 13 countries with different income levels during 1960- 2001. The countries were divided into four different income levels: low income, less than the average, more than the average and high income. He used a Granger Causality Test and showed that the causality relation and direction differ among countries depending on income levels. In general, the Keynesian theory of savings as a function of growth was confirmed in countries with low and less than average incomes while the Solow hypothesis that savings is a determinant of economic growth was confirmed in countries with high and more than average incomes.

Anoruo and Ahmad, (2001) analyzed the relationship between saving rate and economic growth for Congo, Cote divoire, Ghana, Kenya, South Africa, and Zambia by using VECM model and co integration test. In their study, except for Nigeria, in all counties, it was recognized that there was a positive relation between saving rate and economic growth. The results of causality test showed that economic growth was Granger cause of saving rates for Ghana, Kenya, Nigeria, and Zambia, in return to this, for Congo, that saving rate was Granger cause of economic growth. Finally, in Cote diIvoire and South Africa, there is a two directional causality between two variables.

(Ekinci and Gul, 2007) analyzed the relationship between domestic savings and economic growth for Turkey by means of VECM model and co-integration test, using the data belonging to the period of 1960 -2004. According to the result of the analysis, there is a long-term relationship between saving rate and economic growth. But, the results of Granger causality analysis, in contrast to the traditional view, it shows that there is one-directional causality in Turkey from economic growth to the domestic saving rates.

Thornton, (2009) conducted a study on Consumer expenditure and the study confirmed that Consumer expenditure is a large component of aggregate demand that even a small

decline in consumption could have a noticeable effect, and the more saving means less consumption. They look data on the U.S. personal saving rate and GDP growth since 1948 for some insight into how likely it is that increased personal saving will slow economic growth.

(Brueckner, et al. 2014) the study confirmed that changes in national income may increase or decrease the aggregate savings rate depending on the level of national income and the increases in borrowing constraints have a positive effect on the aggregate savings rate. The study suggests that in poor countries growth in incomes per capita will lead to increases in aggregate savings rates while, the opposite situation takes place after certain limit in the level of economic development. The acceleration of saving becomes particularly essential, as a main proportion of investment is financed by domestic saving. The heavy dependence of investment on domestic saving strengthens the Lucas Puzzle „why doesn't capital flow from rich to poor countries" (Lucas, 1990) on the lack of capital flows from the developed countries to the developing countries.

Finally, the study confirmed that there is a co integrated result between investment and saving they used bootstrap approach to find out the direction causation that shows investment causes saving for the Japan. An economy faced the crowding out effect of the private sector investment through decline in savings rate as a result of government's indebtedness, the evidence suggests by (Esmail, 2014) reveals that national savings rate is negatively related with federal debt growth and inflation. The study conducted by using Ordinary multiple regressions in Egypt.

Amusa and Busani, (1998) analyze the relationship between domestic saving in case of Botswana. Based on this study the country has relatively high saving to GDP ratio and they used Bound testing approach for cointegration analysis and establish the relationship between domestic savings and economic growth in Botswana. Their result indicate that domestic savings is significantly positively related to growth in Botswana. (Tinaromm, 2005) studied the relationship between savings and economic growth in North Africa using a Vector Error Correction Model for 1946-1992. He concluded that private saving has both direct and indirect effects on economic growth. In his view, the direct effect of

savings is through private investment. He also showed that economic growth has a positive effect on the private savings rate.

Singh, (2010) studied the causal relationship between domestic savings and economic growth in India. He analyzed the short and long run relation between these variables using an Autoregressive Distributed Lag model for the period 1950 to 2002. The results indicate that there is a two-way relationship between savings and economic growth. His results also showed that an increase in savings and capital accumulation will lead to higher income and economic growth. (Jelani, 2013) examine the determinant of national saving in Pakistan and their findings show that GDP, inflation, and fiscal deficit play significant role in determining the national savings of the studied country also coefficient analysis showed that growth rate and increased Government consumption give positive impact in increasing national savings while inflation possessing negative relation with national savings of the country. As from consumers‟ perception when prices of commodities increase people have to spend more on buying which decreases the rate of domestic savings. So it can be argued that there exists a negative and significant relation between inflation and domestic savings which, in turn, directly influences the national savings (Kazmi, 1993).

Hemmi et al. (2007) studied the relationship between precautionary savings and economic growth. They used an Autoregressive Conditional Heteroskedastic (ARCH) model with annual data from 1955 to 1990. They concluded that increased savings can have a favorable impact on sustainable growth. They also found that stronger shocks on precautionary savings result in the higher levels of savings as a whole. As from producers‟ perspective according to Vittorio (1991) when prices rise, producer earns more profit by charging higher prices and ultimately the phenomenon influences the national savings positively. So from producer perspective there exist positive and significant relationship between national savings and inflation rate. There is another study carried out by (Loayza et.al, 2000) in which inflation was taken as one of the explanatory variables of private savings rate and they concluded that there exists a positive and significant relation between savings and inflation rate.

Schultz, (2004) discusses demographic determinants of savings: estimating and interpreting the aggregate association in Asia. He collects the data from 16 countries during the period 1952 to 1992 and used different econometric techniques to find out the statistical results. The dependent variable is saving and explanatory variable is age composition of population. The results shows that the association between the saving rates and age composition is depend on time trends of each country and as well as different priorities of families according to their needs and life style. Results conclude that healthier and stronger life will raise the level of aggregate saving. (Narayan and Siyabi, 2005), discuss an empirical investigation of determinants of Oman's national savings, during the period 1977-2003 using bound testing approach and ARDL model.

The dependent variable is aggregate saving and independent variables are per capita income, urban population rate, domestic credit, current account surplus and money supply. The results indicate that domestic credit, current account deficit and urbanization rate have positive impact on aggregate saving while per capita income and urban population rate and money supply M2 inversely impacted the Oman's aggregate savings. (Carroll, 1994) found a positive one directional ganger causality of growth to saving ,based on the households survey high income household saves more than low income households, the study argued that what the determinant of consumption pattern is depend on habit formation model rather than permanent income model.

Dipendra, (2009) studied the relation between savings and economic growth in India. The goal of this study was to check the long-run relationship between GDP and savings. An Engel-Granger Co-Integrated method was used and the results showed that gross savings of the private sector have a bigger impact on GDP than gross domestic savings. Moreover, gross domestic savings and gross private savings were shown to be co-integrated with GDP. Yet the causality analysis between these variables showed that there is no causality in any direction among them. (Chaudhry et al. 2010) studied the monetary and fiscal determinants of national saving by using ARDL and co-integration approach. And their result show that deposit rate and government expenditures have a positive relationship with national saving in both long run and short run. M2 is negatively

related with national saving in long run but highly significant. Inflation rate is presenting a positive relationship with national saving in short run.

Remolina, Munoz & Martinez, (1990) they found that Savings rate significantly influences the level income at 5% and 10% confidence interval. In the same study the regression for the middle- & low-income groups is quite different from the regression with the only high-income countries. The variables P value including saving rate shows statistically significant with the level of economic growth. (Odhiambo, 2008) investigated the relationship between savings and economic growth in Kenya. He studied the causality relation between savings, economic growth and the fiscal deficit using panel data from 1991 to 2005. His emphasis was on two-way causality tests which differentiates his work from other studies. The results show that there is Granger causality between savings and economic growth, and that savings are an important driver for development of the financial sector.

Odhiambo, (2009) also studied the relationship between savings and economic growth in South Africa. He used a multi-variable causality test with data from 1950 to 2005 which showed that there is one-way causality from the savings rate to foreign capital inflows. His results also show that economic growth Granger causes foreign capital inflows. Therefore, he concludes that policies should be directed toward increasing savings and economic growth in the short run.

Aghion and et al., (2006) show that savings is significantly associated with higher levels of FDI inflows and equipment imports and the effect on growth is significantly larger for poor countries than rich (Anoruo and Ahmad, 2001) used VECM and VAR model and investigated that there is a long run equilibrium relationship between saving and growth time series and the existence of causality in at least one direction, For the sample of 7 African countries that the study examined there is also causality runs from economic growth to growth rate of domestic savings.

Masih and Peters, (2010) studied the mutual relation between savings and economic growth in Mexico using a Vector Auto-Regressive (VAR) method and annual data from

1960 to 1996. They concluded that savings have a positive effect on economic growth. Similar result are observed by (Sheggu, 2009) that the relationship between savings and economic growth in Ethiopia from 1960-2003 in a vector autoregressive model (VAR). Sheggu finds that faster growth rates in the gross domestic savings caused higher growth rates in real GDP in Ethiopia. But another study by (Ramakrishna and Rao, 2012) studied the causal link between savings and investment in Ethiopia through co integration method from the period 1981 -2009 and examined that there is no causality between savings and investment in both direction for Ethiopia.

Yohannes, (2014) studied the macroeconomic determinants of gross national saving in Ethiopia using time series annual data form 1970-2011 by using ARDL approach. He analyzed as that financial development and Current account deficit are significant determinants of gross national saving, but gross national disposable income, dependency ratio, budget deficit and inflation found to be statistically insignificant determinants of gross national saving in Ethiopia in the long run. And he Conclude as (H. Ademe (2013) that in the short run, gross national disposable income, financial development, current account deficit and budget deficit found to have significant. (Haile, 2013) analyzed the macroeconomic determinants of gross national saving in Ethiopia using time series annual data form 1971-2011, and conduct the study by ARDL bounds testing approach and ECM both are used to analyze short run and long run relationship. He found that financial development and Current account deficit are significant determinants of gross national saving in Ethiopia in the long run. Nevertheless, gross national disposable income, dependency ratio, budget deficit and inflation, statistically insignificant determinants of gross national saving in Ethiopia in the long run. However, in the short run, except consumer price index and dependency ratio the rest of the explanatory variables such as gross national disposable income, financial development, current account deficit and budget deficit found to have statistically significant.

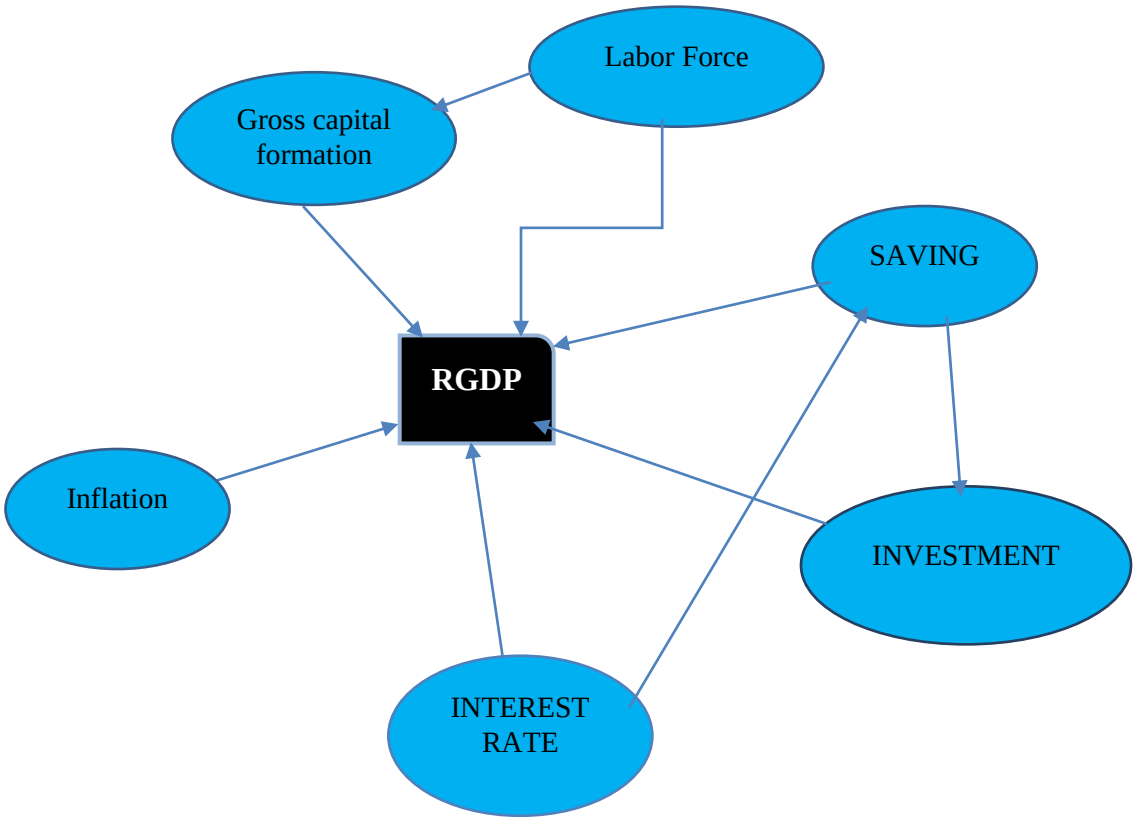
In general, (Mason, 1988), a cross country comparison the study found that the positive relationship between domestic saving and gross domestic investment. Recently (Jagadeesh, 2015) explored the relationship between savings and economic growth in his

empirical study the data were stationary and co- integrated, saving rate positively or directly related to the GDP in Botswana. (Ciftcioglu and Begovic, 2010) the relationship between savings and investment in the sample of advanced economies of the Europe found statistically significant evidence of saving and GDP. (Aghion and Comin, 2009) used a cross-country panel regression, and estimates lagged saving on growth are significantly larger for poor than for rich countries. The average estimate of the effect of saving on growth for the sample of rich countries is zero. (Brueckner, et al. 2014) confirmed that changes in national income may increase or decrease the aggregate savings rate depending on the level of national income and the increases in borrowing constraints have a positive effect on the aggregate savings rate. (Carroll, 1994) found a positive and one directional ganger causality of growth to saving. However, to the best knowledge of the researcher tries to include additional variable interest rate rather than the previous studies and tries to use the recent data (1975-2021) to see trends and patters of interest rate, national saving, investment and economic growth in Ethiopia.

In Summary, the evidence from the above theoretical and empirical literature review show that the link between, national saving and economic growth rate is mixed. Some studies found that national saving insignificant impact on economic growth, contrary to this result; others found that national saving significant impact on national saving rate, the causality between the two variables is different for different studies. The different findings between of variables hold true for Ethiopia and other developing countries. This is practically there is difference between countries in policy issues, political stabilities, and growth or development levels. These situations cause difference in time series information of the variables. The other problem that caused mixed result is the kind of data used, methodology and procedural errors. The problem with methodology used is that some used ARDL, VECM and others used co-integration. But the use of this methodology depends up on unit root tests. If the variables are integrated of different orders, is employed. My study differs from these studies in that it analysis the short run and long run link between national saving, and economic growth (RGDP), by using ARLD integrated of I(0) and I(1) approach and Granger(1987) causality Method in time series data of the variables in Ethiopia.

However, to the best knowledge of the researcher tries to include additional variable interest rate rather than the previous studies and tries to use the recent data (1975-2021) to see trends and patters of interest rate, national saving, investment and economic growth in Ethiopia.

2.3. Conceptual Framework



Source: Own Drawing (2021)

The Relationship Between saving, interest rate and investment has direct influence and the rest variables has either Direct or Indirect on Ethiopian GDP.

Banks increases the interest rate then people saves more, so there is high deposit in the bank the investment moves up ward.

CHAPTER THREE

3. METHODOLOGY

RESEARCH METHODOLOGY

In the literature part different theories and studies conducted on different level of countries orderly developed and developing. Those conclude about the nature of relationship between saving, investment, interest rate and economic growth in different aspects. while, the main objective of investigating the relationship, and direction of causality of saving, investment, interest rate on economic growth in the long run and short run for Ethiopia and the following methods are designed to reach on more meaningful results.

3.1. Sources of Data and Variable Description

This study investigates the empirical relationship between saving, investment, interest rate and economic growth and their causality in Ethiopia. This relationship between economic growth and saving, investment, interest rate was based on the data of the real GDP capita measured in constant ETB and saving, investment, interest rate which is measured in ETB.

3.1.1 Sources of Data

The data used in this study was annual covers the period from 1981/82 to 2019/20 for Ethiopia regarding 2011 as a base year. The data sourced from the National Bank of Ethiopia (2019).

3.1.2 Definitions of the variables

The variables that this study uses are described as the following:

***Real GDP (RGDP)*:** is a macroeconomic measure of the value of economic output adjusted for price changes (i.e., inflation or deflation). This adjustment transforms the money-value measure, nominal GDP, into an index for quantity of total output. GDP is the sum of consumer spending, Investment made by industry, Excess of Exports over Imports and Government Spending. Due to

inflation GDP increases and does not actually reflect the true growth in economy. That is why inflation rate must be subtracted from the GDP to get the real growth percentage called the real GDP. Most of the studies conducted on the relationship of economic growth with explanatory variables. (Colombage, 2009, Koch et al 2005) used the Gross Domestic Product (GDP) as the measurement of economic growth. Hence, this study was used the growth form of real GDP as a proxy to represent economic growth.

National Saving Rate (NS)*:* In economics, a country's national savings is the sum of private and public savings. It is generally equal to a nation's income minus consumption and government purchases. Private savings consists of savings made by the household and the business organization, public saving is the saving made by the government sectors which are based on the budgetary condition of the government.

Investment (INV)**:** Investment contributes to growth in aggregate wealth, but the investment cannot increase without increasing in the amount of saving. Thus, savings perform a major role in providing the national capacity for investment and production, which was affect the potential of economic growth. A serious constraint to sustainable economic growth can cause from the low rate of saving.

Interest Rate (IR)**:** An interest rate is either the cost of borrowing money or the reward for saving it. It is calculated as a percentage of the amount borrowed or saved. You borrow money from banks when you take out a home mortgage. Other loans can be used for buying a car, an appliance, or paying for education. Banks borrow money from you in the form of deposits, and interest is what they pay you for the use of the money deposited. They use the money from deposits to fund loans. Banks charge borrowers a slightly higher interest rate than they pay depositors. The difference is their profit. Since banks compete with each other for both depositors and borrowers, interest rates remain within a narrow range of each other. Interest rates affect how you spend money. When interest rates are high, bank loans cost more. People and businesses borrow less and save more. Demand falls and companies sell less. The economy shrinks. If it goes too far, it could turn into a recession.

When interest rates fall, the opposite happens. People and companies borrow more, save less, and boost economic growth. But as good as this sounds, low-interest rates can create inflation. Too much money chases too few goods. The Federal Reserve manages inflation and recession by controlling interest rates. So, pay attention to the Fed's announcements on falling or rising interest rates. You can reduce your risks when making financial decisions such as taking out a loan, choosing credit cards, and investing in stocks or bonds. Interest rates affect your cost of borrowing money. Always compare interest and APR when considering a loan product.

Gross Capital Formation (GCF) The gross fixed capital formation together with the changes in inventories form the gross investments in the national accounts . It records the value of equipment (such as machines), real estate and other facilities (such as research and development) that have been acquired by domestic people in order to use them in the production process for more than a year. “Gross” means including depreciation . Without depreciation one speaks of net capital investments. The gross capital are an aggregate in the use statement of the National Account of the gross domestic product .

Labor Force (TLF) the MoFEC (2018/19) data of labor force clarifies the population aged between fifteen (15) to sixty-four (64) years, which is precisely the active and productive population in the country. Solow (1956) and Swan (1956) advise that labor force should be included in a neoclassical growth model because of its impact on general productivity. It has been proven empirically that labor force is a good measure of economic growth. Thus, the expected sign of private sector credit to GDP ratio is positive.

Inflation (INF) From theoretical and empirical perspective, determining the direction of causality between economic growth and inflation in the developing countries is very controversial (e.g., Hossain & Chowdhurry, 1996). In 1950s, the Structuralist Economist view of inflation, as pioneered in Latin America, persuasively argued that moderate inflation and economic growth are positively related. This was in contradiction to the policy advice of the international lending institutions (Meier, 1995; Mallik & Chowdhurry, 2001). Stated in simple terms, inflation stimulates the economy since nominal wages may lag behind prices, allowing for slower adjustment to wage expectation.

Table 3.1 Definition of variables and expected signs

No	Variable	Definition of Variable	Expected Sign
01	RGDP	Real GDP is a macroeconomic Variable, that measure the value of economic output adjusted for price changes (inflation /deflation).	+ V
02	SAVING	national savings is the sum of private and public savings. In generally equal to a nation's income minus consumption and government purchases	+ V
03	INVESMENT	Investment is an aggregate wealth. Investment cannot increase without increasing in the amount of saving. Thus, savings perform a major role in providing the national capacity for investment and a serious constraint to sustainable economic growth.	+ V
04	GCF	It records the value of equipment (such as machines, real estate and other facilities (such as research and development)) that have been acquired by domestic people in order to use them in the production process for more than a year.	+ V
05	TLF	Solow (1956) and Swan (1956) advise that labor force should be included in a neoclassical growth model because of its impact on general productivity. It has been proven empirically that labor force is a good measure of economic growth.	+ V
06	INFLATION	Almost all countries consider sustaining high level of economic growth with low level of inflation as their macroeconomic objective. But there has been a debate about the nature of relationship between these two important variables. Inflation, the steady rise of prices for goods and services over a period, has many effects, good and	-/+ V

		bad. Inflation erodes purchasing power or how much of something can be purchased with currency. Because inflation erodes the value of cash, it encourages consumers to spend and stock up on items that are slower to lose value. It lowers the cost of borrowing and reduces unemployment	
07	INTEREST RATE	A counter point is that higher interest rates might cause an inflow of hot money (SR capital flows) into an economy thus causing a currency appreciation. This can make export industries less price competitive which might lead to a slowdown in export sector output, investment and employment as well as a worsening of the net trade balance. When increased cost of borrowing currency will appreciate, increased cost of bank loans inflation will tend to be lower and banks may be more willing to lend economic growth will tend to be slower and unemployment could rise.	-/+ V

3.2 Model Specification

Many scholars have used different models to analyses the contributions of government revenue and related concepts on economies of different developing and developed countries. The study would be used macroeconomic development indicators (GDP, Interest Rate, Domestic Saving, and Investment). However, this study is interested to investigate the trends, short run and long run relationship between interest, national saving and investment on economic growth in Ethiopia; it improves the past studies by including the variable interest rate. From macroeconomic perspective, this model states that economic growth depends on Domestic Saving, Investment and Interest Rate. Therefore, functional form between these variables is given as

$RGDP_t = F(S_t, GCF_t, NIV_t, IRt, TLF_t, INF_t)$ --3

Where; $RGDP_t$ is a real aggregate output, S_t is Domestic Saving, IR_t is Interest Rate, NI_t is Investment and the Subscript t denotes the time period.

$RGDP_t = \beta_0 + \beta_1 S_t + \beta 2NIV_t + IR_t + GCF_t + \beta_1 TLF_t + \beta_1 INF_t + U_t$-------------------(3.1)

Where, β_0= Intercept Term β_1 and β_2 =Parameter known as partial regression coefficient

$U_t =$ Error term or unexplained variable $t =$ Denotes variable at time t

The functional form of the bi-variant model is specified as below

$RGDP = f(S, NIV, IR, GCF, TLF, INF) -$ (3.2)

Where, RGDP= Real Domestic Saving, National Investment and Interest Rate

$RGDPt = \beta_0 + \beta_1(S, NI, GCF, IR_)t + u_t -$ (3.3)

Where, β_0= Intercept Term (Parameter) β_1= parameter known as partial regression coefficient

u_t= Error term or unexplained variable $t =$ Denotes variable at time t

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 both models are estimated using Johansen co-integration test, VAR, VECM and grange causality test environment. All variables are transformed into their natural logarithm so that their first differences approximate their growth rates. On the other hand, to

eliminate the impact of heteroscedasticity for economic variable time series data, all variables are in natural logarithm. The empirical model will be designed to model the three variables after logarithmic transformation for the linear model, is easy to verify, so the transformed model:

$$ln\,R\,GDP_t = F(ln\,S_t\,, ln\,N\,I_{t,}, ln\,GCF_t\,ln\,I\,Rt)\text{----------} \quad (3.4)$$

When two or more entirely unrelated variables are trending over time, they will appear to be correlated simply due to shared directionality. Correlation does not necessarily imply causation in any meaningful sense of that word. The econometric graveyard is full of magnificent correlations, which are simply spurious or meaningless. Thus, traditional linear regression or correlation methods cannot be used to establish casual relations among a group of variables. Two methods for testing for causality among time-series variables are Granger causality tests (Granger, C.W.J. 1969) and co-integration analysis (Engle, R.E. & C.W.J. Granger.1987). Hendry and Juselius discuss the application of these methods, where they have been applied extensively to test for causality and co-integration between energy, GDP, and other variables from the late 1970s on as cited in Mehari, 2010. This study used the Granger causality test and co-integration analysis to investigate the causal relationship between saving, investment, interest rate and economic growth in the case of Ethiopia.

The standard Granger (1969) test will be employed in the relevant literature test the causal relationship between two variables. This test states that, if past values of a variable Y significantly contribute to forecast the value of another variable X_{t+1} then Y is said to Granger cause X and vice versa. The test is based on the following regressions.

$$Y_t = \beta_0 + \sum_{q=1}^{N} \beta_1 Y_{t-q} + \sum_{q=1}^{N} \beta_2 S_{t-q} + \sum_{q=1}^{N} \beta_3 NI_{t-q} + \sum_{q=1}^{N} \beta_4 IR_{t-q} + \sum_{q=1}^{N} \beta_5 GCF_{t-q} + \varepsilon_{5t} - - - (4)$$

$$S_t = \alpha_0 + \sum_{q=1}^{M} \alpha_1 Y_{t-q} + \sum_{q=1}^{M} \alpha_2 S_{t-q} + \sum_{q=1}^{M} \alpha_3 NI_{t-q} + \sum_{q=1}^{M} \alpha_4 IR_{t-q} + \sum_{q=1}^{M} \alpha_5 \quad GCF_{t-q} + \varepsilon_{5t} — (5)$$

$$NI_t = \mu_0 + \sum_{q=1}^{O} \mu_1 Y_{t-q} + \sum_{q=1}^{O} \mu_2 S_{t-q} + \sum_{q=1}^{O} \mu_3 NI_{t-q} + \sum_{q=1}^{O} \mu_4 IR_{t-q} + \sum_{q=1}^{O} \phi_4 GCF_{t-q} + \varepsilon_{5t} - -(6)$$

$$IR_t = \phi_0 + \sum_{q=1}^{P} \phi_1 Y_{t-q} + \sum_{q=1}^{P} \phi_2 S_{t-q} + \sum_{q=1}^{P} \phi_3 NI_{t-q} + \sum_{q=1}^{P} \phi_4 IR_{t-q} + \sum_{q=1}^{P} \phi_4 GCF_{t-q} + \varepsilon_{5t} - -(7)$$

$$GCF_t = \phi_0 + \sum_{q=1}^{P} \phi_1 Y_{t-q} + \sum_{q=1}^{P} \phi_2 S_{t-q} + \sum_{q=1}^{P} \phi_3 NI_{t-q} + \sum_{q=1}^{P} \phi_4 IR_{t-q} + \sum_{q=1}^{P} \phi_5 GCF_{t-q} + \varepsilon_{5t} - -(8)$$

Where Yt, St, Nit, GCFt and IRt, are the variables to be tested, and ε_{1t}, ε_{2t}, ε_{3t}, $\varepsilon_{4t}$and ε_{5t}, are mutually uncorrelated white noise errors, and t denotes the time period and "q" is number of lags.

The six variables were measured by their natural logarithm so that their first difference approximates their growth rates.

Hypothesis we use standard Granger is that

The null hypothesis is $\beta_i = \alpha_i = \mu_i = \phi_i$

$= 0$ for all i's versus the alternative hypothesis that

$\beta_i \neq \alpha_i \neq \mu_i \neq \phi_i$

$\neq 0$ for at least some i's. For instance, if the coefficient of β_2 statistically significant but α_2 is not, then energy cause output growth and vice versa. But if both β_2 and α_2 are significant then causality runs both ways. Recent developments in the time series analysis have suggested some improvements in the standard Granger test. The first step is to check for the stationary of the original variables and then test co-integration between them. According to Granger (1986), the test is valid if the variables are not Co-integrated. Second, the results of Granger causality are very sensitive to the selection of lag length. If the chosen lag length is less than the true lag length, the omission of relevant lags can cause bias. If the chosen lag length is more, the irrelevant lags in the equation cause the estimates to be inefficient.

Finally, both the co integration technique and Granger causality tests, would be employed to determine the causal relationship between RGDP and (Interest Rate, Domestic Saving, gross capital formation and Investment). The basic model relates economic growth to Interest Rate, Domestic Saving, and Investment is the model that shown in equation (3.4).

3.3. Unit Root Test

The stationary properties of the variables are checked. A variable is said to be stationary if it's mean, variance and auto-covariance remains the same no matter at what point measure them. The null hypothesis of non-stationary is tested against alternative hypothesis of stationary.

A number of tests are available in the literature to check the existence of the unit root problem both in the level of the variables as well as in their first difference, i.e., to determine the order of integration. The Dickey Fuller (DF) test is applicable if error terms are uncorrelated. If the error terms are correlated, DF test is useless. Augmented Dickey Fuller (ADF) test takes care of this problem by "augmenting" the equation(s) of DF test by adding the lagged values of the dependent variable(s). To test the unit root property of the variables, we employed Augmented Dickey Fuller test (ADF). The equation for ADF test is as follows: In this study the method of vector autoregressive model (ARDL) is adopted to estimate the effects of national saving on economic growth. This methodology used to recognize the dynamic response between national saving, economic growth and the other variables. The following methodology is applied to investigate the causal relationship between Interest Rate, Domestic Saving, Investment and Economic Growth.

In case of spurious regression, as the sample size increases, the coefficient of variance doesn't tend to be constant and the consistency property of OLS estimators is not hold. The sampling distribution of the estimators will be non-standard and the usual statistics (t and F) based on normal become invalid (Maddala, 1992). Nelson and Plosser (1982) distinguish between two types of stationary series: trend stationary processes (TSP) and difference stationary processes (DSP). These two distinctions derive from the two widely used techniques of converting non-stationary series into stationary series.

The first one is trend stationary; in this case the mean trend is deterministic. Once the trend is estimated and removed from the data, the residual series is a stationary stochastic process. Trending mean is a common violation of stationary. There are two popular models for non-stationary series with a trending mean. The Second one is difference stationary; in this case the mean trend is stochastic. Differencing the series *d* times yields a stationary stochastic process.

Though both techniques may lead to stationary series, caution is needed in choosing between the two as de-trending a DSP series or differencing a TSP series may lead to spurious autocorrelation. Nelson and Plosser (1982) indicate that in most economic time series DSP is more appropriate and the -TSP should be applied only if we assume the residuals exhibit strong autocorrelation.

Time series that can be made stationary by differencing are called integrated processes. Specifically, when *d* differences are required to make a series stationary, that series is said to be integrated of order *d,* denoted I (*d).* Processes with $d \geq 1$ are often said to have a unit root. The technique of co-integration involves three steps. The first step requires a determination of the order of integration of the variables of interest. We have for this purpose will be used two popular tests: namely Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) test based on H0: Xt is not I (0). The regression model of the ADF unit root test is given by the following equations.

$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \varepsilon_t$---------- (8)

Where Yt denotes the variables RGDP, interest rate, national saving, investment. All variables are in logarithm form. Δ is the difference operator; β_0 and $\beta_1$are parameters to be estimated; ε_t is white noise.

The regression models of the ADF unit root test below:

$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^{q} \zeta_i \Delta Y_{t-1} + \varepsilon_t$---------- (9)

The hypotheses of the above equation form are:

$H_0: \delta = 0$; there is a unit root, i.e., the time series is non stationary

$H_1: \delta \neq 0$; there is no unit root, i.e., the time series is stationary (level stationary)

The Null hypothesis (Ho): Yt is not I(0), if the calculated ADF statistics are less than their critical values from Fuller's table, then the null hypothesis (Ho) will be accepted and the series are stationary or integrated or order one i.e, I(1). If the coefficient of the lag of Y_{t-1}, δ is significantly different from zero, then the null hypothesis is rejected.

To allow for the various possibilities, the ADF test is estimated in three different forms, that is, under three different null hypotheses.

1st possibility: Yt is a random walk without drift: $\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^{q} \zeta_i \Delta Y_{t-1} + \varepsilon_t$

2nd possibility: Yt is a random walk with drift: $\Delta Y_t = \beta_0 + \delta Y_{t-1} + \sum_{i=1}^{q} \zeta_i \Delta Y_{t-1} + \varepsilon_t$

3rd possibility: Yt is a random walk with drift around a stochastic trend: $\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^{q} \zeta_i \Delta Y_{t-1} + \varepsilon_t$

$\beta_0$is intercept, t is linear time trend, q is the number of lagged first differences, and (i=1,2,3,…q) is q is the number of lagged terms chosen by Akaike Information Criterion (AIC) to ensure that $\varepsilon_t$is white noise.

3.4. Auto Regressive Distributed Lag Model (ARDL)

The study used the Auto Regressive Distributed Lag Model (ARDL) The ARDL approach was used by, among others, Narayan (2006), argued that the ARDL method proposed by Pesaran et al. (2001) can perform well in small samples and irrespective of whether the variables are I(0), I(1), or mutually co integrated, and it is unbiased and efficient. The ARDL approach uses two-steps to estimate the long run relationship.

3.5. Methods of Data Analysis and presentation

The study used both descriptive and econometrics analysis. The data was presented in both graph and table.

3.6 Co-integration test

Granger causality tests are sensitive to the stationary of the series. This is why we first study the stationary properties of the variables. Having, discuss a variety of unit root tests, in order to proceed with co-integration and VEC analyses one needs to be confident as to the order of integration of the series used.

In the second step we estimate co-integration regression using variables having the same order of integration. Co-integration among the variables means that two or more variables are said to be co-integrated if they share common trends that is they have long run equilibrium relationships. More, co-integration is the necessary criteria for stationary among non-stationary variables. The series are linked by some long-run equilibrium relationship from which they can deviate in the short run but they must return to in the long-run that is they exhibit the same stochastic trend.

Co-integration can be considered as an exception to the general rule which establishes that, if two series are both I(1), then any linear combination of them will yield a series which is also I(1). The exception is when a linear combination of two or more series is integrated of a lower order: In this case, in fact, the common stochastic trend is cancelled out, leading to something that is not spurious but that has some significance in economic terms (Amirat and Bourimun dated).

The unrestricted co-integration rank tests both trace statistics (trace) and maximum Eigen value show the existence of one co-integrating vectors in the system. This means, the null hypothesis of no co-integration is rejected by both statistics. If the test statistics is greater than the critical values, the null hypothesis that there exist r co-integrating vectors against the alternative hypothesis that are r+1 (for λtrace) or more than r (for λmax) is rejected. Thus, both λtrace and maximum Eigen value (λmax) conclude that there is no co-integrating vector among the variables. There is only one Eigen value (λmax) significant at 1% level and this outcome determines that the rank of the co-integration is unity. The result of table 4.4 show that among the variables there is one long run relationship. After indicating the presence of the long-run co-integration relationship among model variables using the Johansen approach, the short-run dynamics of the long-run economic growth is examined by estimating an error correction model.

If a group of variables are individually integrated of the same order and there is at least one linear combination of these variables that is stationary, then the variables are said to be co-integrated. The co-integrated variables will never move far apart, and will be attracted to their long-run relationship. Testing for co-integration implies testing for the existence of such a long-run relationship between economic variables. If the series are integrated of the same order one can proceed with the co-integration tests. This initial formulation by Granger used levels of variables as shown in equations. But, following the development of unit root testing and cointegration, for non-stationary variables, integrated of order one or I(1),the following will be made:

$$\Delta Y_t = \beta_0 + \sum_{q=1}^{N} \beta_1 \Delta Y_{t-q} + \sum_{q=1}^{N} \beta_2 \Delta S_{t-q} + \sum_{q=1}^{N} \beta_3 \Delta NI_{t-q} + \sum_{q=1}^{N} \beta_4 \Delta IR_{t-q} + \sum_{q=1}^{N} \beta_5 \Delta TLF_{t-q} + \sum_{q=1}^{N} \beta_6 \Delta INFL_{t-q} + \sum_{q=1}^{N} \beta_7 \Delta INFL_{t-q} + \varepsilon_{1t} - -(10)$$

$$\Delta S_t = \alpha_0 + \sum_{q=1}^{M} \alpha_1 \Delta Y_{t-q} + \sum_{q=1}^{M} \alpha_2 \Delta S_{t-q} + \sum_{q=1}^{M} \alpha_3 \Delta NI_{t-q} + \sum_{q=1}^{M} \alpha_4 \Delta IR_{t-q} + \sum_{q=1}^{N} \alpha_5 \Delta TLF_{t-q} + \sum_{q=1}^{N} \alpha_6 \Delta INFL_{t-q} + \sum_{q=1}^{N} \alpha_7 \Delta INFL_{t-q} + \varepsilon_{2t} - -(11)$$

$$\Delta NI_t = \mu_0 + \sum_{q=1}^{o} \mu_1 \Delta Y_{t-q} + \sum_{q=1}^{o} \mu_2 \Delta S_{t-q} + \sum_{q=1}^{o} \mu_3 \Delta NI_{t-q} + \sum_{q=1}^{o} \mu_4 \Delta IR_{t-q} + \sum_{q=1}^{N} \mu_5 \Delta TLF_{t-q} + \sum_{q=1}^{N} \mu_6 \Delta INFL_{t-q} + \sum_{q=1}^{N} \mu_7 \Delta INFL_{t-q} + \varepsilon_{3t} - (12)$$

$$\Delta IR_t = \phi_0 + \sum_{q=1}^{P} \phi_1 \Delta Y_{t-q} + \sum_{q=1}^{P} \phi_2 \Delta S_{t-q} + \sum_{q=1}^{P} \phi_3 \Delta NI_{t-q} + \sum_{q=1}^{P} \phi_4 \Delta IR_{t-q} + \sum_{q=1}^{N} \phi_5 \Delta TLF_{t-q} + \sum_{q=1}^{N} \phi_6 \Delta INFL_{t-q} + \sum_{q=1}^{N} \phi_7 \Delta INFL_{t-q} + \varepsilon_{4t} \quad (13)$$

$$\Delta TLF_t = \phi_0 + \sum_{q=1}^{P} \phi_1 \Delta Y_{t-q} + \sum_{q=1}^{P} \phi_2 \Delta S_{t-q} + \sum_{q=1}^{P} \phi_3 \Delta NI_{t-q} + \sum_{q=1}^{P} \phi_4 \Delta IR_{t-q} + \sum_{q=1}^{N} \phi_5 \Delta TLF_{t-q} + \sum_{q=1}^{N} \phi_6 \Delta INFL_{t-q} \sum_{q=1}^{N} \phi_7 \Delta INFL_{t-q} + + \varepsilon_{4t} \quad (14)$$

$$\Delta INIF_t = \phi_0 + \sum_{q=1}^{P} \phi_1 \Delta Y_{t-q} + \sum_{q=1}^{P} \phi_2 \Delta S_{t-q} + \sum_{q=1}^{P} \phi_3 \Delta NI_{t-q} + \sum_{q=1}^{P} \phi_4 \Delta IR_{t-q} + \sum_{q=1}^{N} \phi_5 \Delta TLF_{t-q} + \sum_{q=1}^{N} \phi_6 \Delta INFL_{t-q} + \sum_{q=1}^{N} \phi_7 \Delta INFL_{t-q} + \varepsilon_{4t} \quad (15)$$

$$\Delta GCF_t = \phi_0 + \sum_{q=1}^{P} \phi_1 \Delta Y_{t-q} + \sum_{q=1}^{P} \phi_2 \Delta S_{t-q} + \sum_{q=1}^{P} \phi_3 \Delta NI_{t-q} + \sum_{q=1}^{P} \phi_4 \Delta IR_{t-q} + \sum_{q=1}^{N} \phi_5 \Delta TLF_{t-q} + \sum_{q=1}^{N} \phi_6 \Delta INFL_{t-q} + \sum_{q=1}^{N} \phi_7 \Delta INFL_{t-q} + \varepsilon_{4t} \quad (16)$$

Where β_0, μ_0, α_0 *and* ϕ_0 are parameters of to be estimate Δ is the first difference operator, so that the terms are introduced in differences to ensure that they are stationary or I(0). Here the concept of causality is formulated in terms of changes to the variables and the presence of

Granger-causality depends on the significance of the ΔY_{t-q} terms and ΔE_{t-q} terms in equations. This study considers a number of co-integration tests, namely the Engle-Granger method commonly known as the two-step estimation procedure, the Phillips-Ouliaris methods and the Johansen's procedure.

3.6.1 Engle Granger Method

The Engle-Granger, EG has two steps, first create the whole association equation of log (S), log (NIV) and log (IR) on log (RGDP) and then test the residual series from which estimated equation parameters co-integration is stable of not. As we have stated, the regression of non-stationary series on other series may produce spurious regression. If each variable of the time series data is subjected to unit root analysis and it is found that all the variables are integrated of order one, I(1), then they contain a unit root. There is a possibility that the regression can still be meaningful (i.e. not spurious) provided that the variables co-integrate. In order to find out whether the variables co-integrate, the least squares regression equation was estimated and the residuals (the error term) of the regression equation are subjected to unit root analysis. If the residuals are stationary, that is I (0), it means that the variables under study co-integrate and have a long-term or equilibrium relationship.

In the two-step estimation procedure, Engle-Granger considered the problem of testing the null hypothesis of no cointegration between a set of variables by estimating the coefficient of a statistic relationship between economic variables using the OLS and applying well-known unit root tests to the residuals to test for stationary. Rejecting the null hypothesis of a unit root is evidence in favor of co-integration.

In the first step we estimate co-integration regression using variables having the same order of integration. The co-integration equation estimated by the OLS method is will be given as:

$$Y_t = \gamma_0 + \gamma_1 X_{ti} + \xi_t \quad \text{---------- (17)}$$

Where Y_t is real GDP and X_t is the i^{th} either saving, National Investment, and Interest rate, second step residuals (ξ_t) from the co integration regression are subjected to the stationary test based on the following equations.

Dickey – Fuller (DF)

$$\Delta\xi_t = \alpha + \beta\xi_{t-1} + \nu_t \quad \text{----------} (18)$$

Augmented Dickey Fuller (ADF) test

$$\Delta\xi_t = \alpha + \beta\xi_{t-1} + \sum_{i=1}^{q} \varphi\Delta\,\xi_{t-i} + \nu_t \quad \text{----------} (19)$$

Where, $\xi_t$is the residual from equation (a). The null hypothesis of non-stationary is rejected if $\beta$is negative and the calculated DF or ADF statistics is less than the critical value from Fuller's table, i.e., there is a long run stable relationship between the two variables and causality between them is tested by the error correlation model (ECM). Alternatively, if the null hypothesis of non-stationary is rejected and the variables are not co-integrated then the standard Granger causality test is appropriate.

3.6.2 Phillips Ouliaris Method

Phillips-Ouliaris introduced two residual-based tests namely: the variance ratio test and the multivariate trace statistics. These residual-based tests are used in the same way as the unit root tests, but the data are the residuals from the cointegrating regression. These tests seek to test a null hypothesis of no cointegration against the alternative of the presence of cointegration using scalar unit root tests applied to the residuals. Phillips-Ouliaris methods are based on residuals (differences between the observed and expected values) of the first order autoregression, AR (1), equation. The multivariate trace statistics has the advantage over the variance ratio test in that it is invariant to normalization, that is, whichever variable is taken to be the dependent variable, and this test will yield the same result (Buruk, 2014).

3.6.3 Johansen's Method

Johansen (1988) and Johansen and Juselius (hereafter, JJ) (1990) maximum likelihood (ML) procedure is a very popular co-integration test and useful method to determine the long-run relationship among non-stationary variables. The purpose of co-integration test in this study is to examine whether economic growth and Saving, National Investment and Interest Rate share a common stochastic trend, that is, whether they move on the same wave-length in the long-run though there might be some disequilibrium in the short-run. In macro economics variable, two variables are said to be co-integration when they have long term, or equilibrium relationship between them (Engle and Granger, 1987). The aim of the co-integration test is to determine whether a group of non-stationary series is co-integrated or not. The Johansen's methods take its starting points in the Vector autoregressive (VAR) model as:

$$Y_t = \varphi + a_1 Y_{t-1} + a_2 Y_{t-2} + \ldots + a_q Y_{t-q} + AXt + \varepsilon_t \quad \text{---------- (20)}$$

Where Yt is a n- vector of non-stationary I (1) endogenous variables that are integrated of order one-commonly denoted I (1) and Xt is a m vector of exogenous deterministic variables; a_1, a_q and A are matrices of coefficients to be estimated and ε_t is white noise residuals; that is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right hand side variables. Because most economic time series are non-stationary, the above stated VAR model is generally estimated in its difference form as:

$$\Delta Y_t = \varphi + \theta Y_{t-1} + \sum_{i=1}^{q-1} \varpi_i \Delta Y_{t-1} + AX_t + \varepsilon_t; \text{where, } \theta = \sum_{i=1}^{q} a_i \text{ and } \varpi = -\sum_{j=i+1}^{n} a_j \quad \text{---------- (21)}$$

3.6 Vector Error Correction Model

According to Engle-Granger (1987) if two time series are co-integrated then the VECM will represent them most efficiently. If co-integration has been detected between series we know that there exists a long-term equilibrium relationship between them so we apply VECM in order to evaluate the short run properties of the co-integrated series. In case of no co-integration VECM is no longer required and we directly precede to Granger causality tests to establish

causal links between variables. An error correction model is defined as a dynamic model in which the movement of a variable in any period is related to the previous period's gap from the long-run equilibrium. Although it may be possible to estimate the long-run or co-integrating relationship,$Y_t = \beta X_t + \varepsilon_t$ economic systems are rarely in equilibrium, as they are affected by institutional and/or structural changes that might be temporary or permanent.

3.7 Granger Causality Test

The Granger procedure is selected because it consists more powerful but simpler way of testing causal relationship Granger (1986). Using this test the following null and alternative hypotheses are estimated. In testing long-run causality, four hypotheses will test using VAR. First, 'growth hypothesis', which asserts that saving habit cause economic growth as complement to other Saving, Investment and Interest rate in the GDP functions.

$$S_t = \alpha_0 + \sum_{k}^{r} \varphi_2 u_{t-k} + \sum_{q=1}^{M} \alpha_1 Y_{t-q} + \sum_{q=1}^{M} \alpha_2 S_{t-q} + \sum_{q=1}^{M} \alpha_3 NI_{t-q} + \sum_{q=1}^{M} \alpha_4 IR_{t-q} + \varepsilon_{2t} - -(22)$$

Saving is related to its past values, growth in RGDP, Saving, Investment and Interest rate and a certain proportion of equilibrating error.

The null and alternate hypotheses in this case are;

H_0: Economic growth doesn't granger causes domestic saving, national investment and interest rate

H_1: Economic growth doesn't granger causes domestic saving, national investment and interest rate

Second, hypothesis' which suggests that policy on Saving, Investment and Interest rate have no effect on the economic growth.

$$Y_t = \beta_0 + \sum_{k}^{r} \varphi_1 u_{t-k} + \sum_{q=1}^{N} \beta_1 Y_{t-q} + \sum_{q=1}^{N} \beta_2 S_{t-q} + \sum_{q=1}^{N} \beta_3 NI_{t-q} + \sum_{q=1}^{N} \beta_4 IR_{t-q} + \varepsilon_{1t} - -(23)$$

From this growth in RGDP is related to past values of itself, Saving, National Investment and Interest rate and a certain proportion of equilibrating error.

The null and alternate hypotheses in this case are;

H_0: Saving, National Investment and Interest rate doesn't granger cause economic growth.

H_1: Saving, National Investment and Interest rate granger cause economic growth.

Third, feedback hypothesis suggests that saving, National Investment and Interest rate and economic growth are interdependent. Bidirectional causality between Saving, National Investment and Interest and economic growth shows such behavior.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. DESCRIPTIVE STATISTICS

In this section, the summary statistics of dependent and explanatory variables discussed. The dependent variable used in this study was gross domestic product and whereas explanatory variables were interest rate, gross national saving, investment and gross capital formation. The study was examined the relationship between interest rate, gross national saving, investment and gross capital formation and economic growth using time series data over the period 1980/81 – 2018/19. The Macroeconomic variables data were obtained from Ministry of Finance and Economic Cooperation and National bank of Ethiopia.

Table: 4.1. Summary of Descriptive Statistics

	LNRGDP	LNTLF	LNNSAV	LNINVES	LNINTR	LNGCF	INFLATION
Mean	12.30454	17.22960	10.96655	9.612791	1.623078	11.07567	9.070000
Median	12.14945	17.20844	10.75530	9.608040	1.609438	10.71072	7.820000

Maximum	13.77327	17.78587	13.28825	14.52501	2.302585	13.39959	44.36000
Minimum	9.000000	16.69427	9.430363	5.446306	1.098612	9.684511	-9.810000
Std. Dev.	0.861073	0.334525	1.047584	1.877226	0.347941	1.050546	10.91349
Skewness	-0.996847	0.122687	0.633659	0.254058	0.265095	0.790618	1.182693
Kurtosis	6.819355	1.795358	2.561510	2.978783	2.535133	2.597951	5.233918
Jarque-Bera	30.16372	2.455978	2.922351	0.420276	0.807955	4.325671	17.20134
Probability	0.000000	0.292881	0.231963	0.810472	0.667659	0.114999	0.000184
Sum	479.8769	671.9544	427.6955	374.8989	63.30005	431.9513	353.7300
Sum Sq. Dev.	28.17499	4.252474	41.70244	133.9112	4.600402	41.93858	4525.962
Observations	39	39	39	39	39	39	39

Source: EViews 9 output based on NBE data (2021).

As shown in the table 4.1 above, the mean value of log of real Gross domestic product around 12.30454 units over the period 1980/81 – 2018/19 in Ethiopia. The result noticed that the log of real Gross domestic product fluctuates between 9 to 13.77 This implies that real Gross domestic product in most years approaches to the means. The minimum value of RGDP in the study period was 2019. This value may imply that there was political instability and less productivity. So, that in the year of 2019 hunger and unsettlement. The standard deviation of Gross domestic product was 0.861 this confirms that there were medium high variations of Gross domestic product over given period. The reason of this variation may be in same year's stability and productivity happen in the country but in other years the vise verse.

The mean value of the interest rate over the study period was 1.623078 units with the minimum and maximum values of 1.098612 and 2.302585 respectively. There was little variation of deposit interest rate towards its mean value over the study periods with the value of standard deviation 0.347941. This implies that, there was in stability of deposit interest rate for subsequent years under the study period. In this sense, there is no control of minimum and maximum deposit interest rate by the government body. Therefore, this make competition between different banks leads down and also the motivation of customers to deposit was decline.

The mean value of the saving over the study period was 10.97 with the minimum and maximum values of 9.430363 and 13.28825 respectively. There was little variation of national saving towards its mean value over the study periods with the value of standard deviation 1.05.

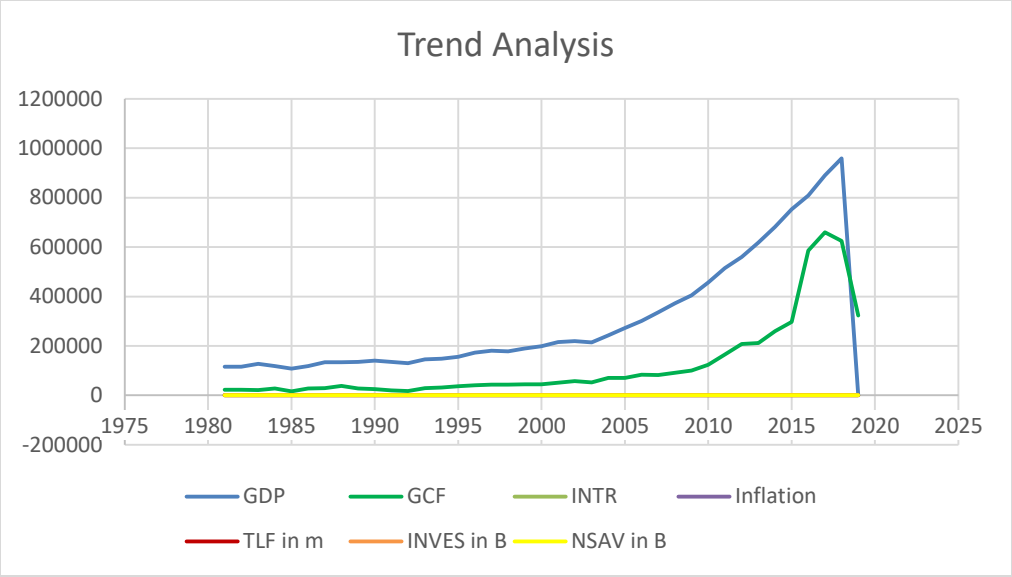
The mean value of the investment over the 1980/81 – 2018/19 was 9.612791units with the minimum and maximum values of 5.446306 and 4.52501respectively. From the MoFEC (2019) in 2010 there was low intereste rate (1.386) and the consecutive year 2011 the interest rate was high (1.609), this result directly affect the investment in these consecutive years. In other hand the maximum investment registered in Ethiopia from the study period as 2010 and the reverce was 2011. There was high variation of investment towards its mean value over the study periods with the value of standard deviation 1.877226. This implies that, there was in stability investment, this may be happen from the fluctuation of interest rate or other political and natural variations under the study period.

Table 4.1 shows the summary of statistics for the variables. The skewness values for most of the variables are nearly positive for almost all variables. This shows skewness to the right. The kurtosis which measures whether data are peaked or flat relative to normal distribution with an expected variables are required to have normal distribution before they are used in any parametric statistical method. Skewness and kurtosis give indication as the nature of distribution of variables. Skewness is a measure of symmetry or the lack of symmetry. The skewness for normal distribution is zero and any symmetric data should have skewness near zero.

The probability value of all variables is high accepting that the normal distribution for all the variables indicating a normality of their unused conditional distributions. The Jarque bera test is used to check hypothesis about the fact that a given is a sample of normal random variable with unknown mean and dispersion. Jarque bera test has the null hypothesis of normal residual hence its rejection requires low probability that a Jarque bera statistics exceeds the observed value.

The evidence from the table shows that all the variables are normally distributed. Also, the variables LNNSAV, LNTLF, LNTLF, LNINVES, LNINTR, LNGCF and INFLATION are positively skewed with LNRGDP. The small standard deviation compared to the mean implies that slow growth rate over the period.

4.1 Investment, National Saving, Interest rate, Total labor force, gross capital formation, inflation and RGDP trend through the year 1981/82 – 2019/20



Source: EViews 9 output based on NBE data

Ethiopia is the second-most popular country in Sub-Saharan Africa with a population of about 112.1 million (MoFEC, 2019). One of the world's oldest civilizations, Ethiopia is also one of the world's poorest countries. The country passes different ruling systems and economic strategies. During *1980/81 – 2018/19* the rate of growth of GDP averaged 1.55 percent per annum, while population growth rate was less than a 2.6 % per annum. This leads to a decline in per capita income of about 1.05 percent. Due to different reasons Ethiopia was one of the lowest in the world in terms of standard of living and political stability (Eshetu 2004). The country's economy showed a remarkable change since the SDPRP (2002/03). Despite some ups and downs the economy grew on average by 11% per annum during 2003/04 -2015/16 (MoFEC 2016). It is 6 times bigger as compared to the average economic growth in the dengue regime (1975-1990). From FDRE regime economic growth coming up to 2018 and down sloping in 2019. As a result, Ethiopia is becoming one of the fastest-growing non-oil-producing 24 economies in Africa (African Economic Outlook 2012).

4.2. Unit Root Test

Table 4.2 Results of Augmented Dickey Fuller Test

Variable	Included test equation	ADF t-statistic I(1)	Critical value at 1st deference			PP t-statistic I(1)	Critical value at 1st		Deference I(1)
			1 % level	5% level	**Decision**		1%	5%	**Decision**
LRGDP	Intercept	-0.60453	-3.631	-2.9434	**I (1)**	-4.2242	-3.621023	-2.943427	**I (1)**
	Trend and Intercept	0.3363	--4.2268	-3.5366	**I (1)**	0.53124	-4.226815	-3.536601	**I (1)**
LIR	Intercept	-5.747531*	-3.621	-2.943	**I (1)**	-5.747532*	-3.621023	-2.943427	**I (1)**
	Trend and Intercept	-5.728585**	-4.2268	-3.5366	**I (1)**	-5.728469*	-4.226815	-3.536601	**I (1)**
LINV	Intercept	-5.537026*	-3.632900	-2.948404	**I (1)**	-24.30042*	-3.6210	-.2.9434	**I (1)**
	Trend and Intercept	-5.588540*	-4.243644	-3.544284	**I (1)**	-32.82	-4.2268	-3.5366	**I (1)**
LGCF	Intercept	-3.944**	-3.6329	-2.9484	**I (1)**	-5.961113*	-3.621	-2.9434	**I (1)**
	Trend and Intercept	4.1886***	-4.2529	-3.54849	**I (1)**	-6.796230*	-4.2268	-3.5366	**I (1)**
LNS	Intercept	-7.5013***	-3.621	-2.944342	**I (1)**	-8.896135*	-3.62102	-2.94343	**I (1)**
	Trend and Intercept	-7.53714***	-4.2268	-3.5366	**I (1)**	-9.934782*	-4.226815	-3.536601	**I (1)**
LTLF	Intercept	-6.2971***	3.6210	2.9434	**I (1)**	-6.2971***	-3.6210	-2.94342	**I (1)**
	Trend and Intercept	-6.2636***	-4.2268	-3.5366	**I (1)**	-6.2645	-4.2268	-3.5366	**I (1)**
INFL	Intercept	-6.2971***	-3.621	-2.94342	**I (1)**	-6.2971***	3.6210	-2.94342	**I (1)**
	Trend and	-6.2636***	-4.2268	-3.5366	**I (1)**	-6.2645***	-4.2268	-3.5366	**I (1)**

	Intercept								

Notes: Null hypothesis: series has unit root. *** Rejection at 10%, **Rejection at 5 % and * Rejection at 1% level. Source: Author's own calculation using Eviews 9

The time series under consideration should be checked for stationarity before one can attempt to fit a suitable model. That is, variables have to be tested for the presence of unit root(s) thereby the order of integration of each series is determined. The non-stationarity of the series can be tested by using an Augmented Dickey-Fuller test and Phillips-Perron test. The hypothesis to be tested is: H0: the series is non-stationary or has a unit root against the alternative hypothesis; H1: the series is stationary or has no unit root.

The results of ADF test and PP-test of unit root with intercept but no trend and with intercept and trend first difference for each series are presented in Table 4.2 and the critical values used for the tests are the critical values. The test results presented in Table 4.2 indicate that the null hypothesis, that the series in levels contain unit root, could not be rejected for all the five-time series data sets because, all the three critical value results are less than their respective ADF test and PP-test Statistic and also their respective p-values are greater than the conventional significance level of $\alpha = 0.05$ in level. Since, the null hypothesis cannot be rejected, in order to determine the order of integration of the non- stationary time series.

The same tests were applied to their first differences as indicated in Table 4.2. The order of integration is the number of unit roots that should be contained in the series so as to be stationary. So, table 4.2 suggests that the series of the endogenous variables display a stationary behavior at first difference and all model variables are According to these tests, gross domestic product, Interest rate, Investment, National Saving and Gross capital formation are integrated of order one [I (1)] with intercept and with intercept and trend.

They show that gross domestic product, Interest rate, Investment, National Saving and Gross capital formation are the expected one as some differencing is involved in the process of deriving the variable.

4.3. Optimal Lag Length Selection

Table 4.3 VAR Lag Order Selection

Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNRGDP LNGCF LNINTR LNINVE LNSAV LNTLF INFL
Exogenous variables:
Sample: 1 39
Included observations: 35

Lag	LogL	LR	FPE	AIC	SC	HQ
1	142.1872	NA	8.58e-10*	-6.696412	-5.585449*	-6.312908*
2	161.9119	28.17816	1.25e-09	-6.394967	-4.173042	-5.627959
3	189.9101	31.99794	1.30e-09	-6.566293	-3.233404	-5.415780
4	222.0455	27.54458	1.41e-09	-6.974027*	-2.530175	-5.440010

* 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

From the output, the selected lag order is indicated by an **asterisk sign (*)** which is found in lag 1. The Cointegration test is usually preceded by a test of optimal lag length as the result of the test is affected by the number of lags included in the VAR model. The Likelihood Ratio test [LR], the Final Prediction Error test [FPE], the Akaike information criteria [AIC], the Shwarz information criteria [SIC] and the Hannan-Quinn information criteria [HIC] are used to determine the optimal lag length of the VAR model for cointegration test. Table 4.3 shows that all criteria suggest a lag length of 1 at 5% level of significance and this lag length are used in this study**.**

4.4. Tests for Cointegration

Since the order of integration of each variable in the model is equal to one and the residuals are stationary in level, the variables involved in the model are co-integrated (Engle and Granger, 1987). Then researcher apply the co-integration tests developed by Johansen (1988) to investigate whether there is more than a single co-integration relationship. The co-integration tests include GDP (LGDP), National Saving (LNS), Domestic Investment (LINV), Interest rate (LIR) and Gross Capital Formation (LGCF) over the period 1981/82-2019/20.

The result of the Johansen cointegration test on trace and maximum eigen value test statistics. Both test statistics reveal that there is one cointegrating equation. The decision criteria is that the Trace statistics and Max-Eigen Statistic is greater than 5% critical value we reject null hypothesis. This is because at null hypothesis of cointegration rank (r=0) The trace statistics indicate 1 cointegrating equation, since trace value of 179.2570 is greater than the 5% critical value of 150.5585. The max-eigen value also conform this because of 65.52906is greater than the 5% critical value of 50.59985. We conclude that there exists both co-integration vector, thus there exists meaningful long run relationship between the economic growth (RGDP) and national saving, domestic investment, interest rate and gross capital formation.

Table 4.4 Johansen's trace test and maximum eigenvalue results

Sample (adjusted): 3 39
Included observations: 37 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: LNRGDP LNGCF LNINTR LNINVE LNSAV LNTLF INFL
Lag's interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.829847	179.2570	150.5585	0.0004
At most 1	0.603533	113.7279	117.7082	0.0869
At most 2	0.550767	79.49690	88.80380	0.1943
At most 3	0.458114	49.88901	63.87610	0.4188
At most 4	0.335512	27.21915	42.91525	0.6684
At most 5	0.209292	12.09581	25.87211	0.8054
At most 6	0.087975	3.407233	12.51798	0.8250

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.829847	65.52906	50.59985	0.0008
At most 1	0.603533	34.23100	44.49720	0.4112
At most 2	0.550767	29.60789	38.33101	0.3502
At most 3	0.458114	22.66987	32.11832	0.4424
At most 4	0.335512	15.12334	25.82321	0.6233
At most 5	0.209292	8.688577	19.38704	0.7560
At most 6	0.087975	3.407233	12.51798	0.8250

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-value

4.5. Long-Run Relationships

Table 4.5. Normalized cointegrating coefficients

(standard error in parentheses)

1 Cointegrating Equation(s): Log likelihood 189.9609

Normalized cointegrating coefficients (standard error in parentheses)

LNRGDP	LNGCF	LNSAV	LNINVE	LNINTR	LNTLF	INFL	@TREND(2)
1.000000	-0.518943	-0.137175	-0.028571	0.549215	-5.692699	-0.006421	0.044326
	(0.11287)	(0.02110)	(0.01075)	(0.10398)	(1.20781)	(0.00067)	(0.01306)

Source: Author's own calculation using Eviews 8; *Standard error in parenthesis*

The long run relationship is derived by normalizing growth in LNRGDP from Table 4.5.

The long run relationship is specified mathematically as;

$$DLNRGDP = 0.137175LNNS - 0.549215LNIR + 0.028571LNINV + 0.518943LNGCF + 5.692699LNTLF + 0.006421INFL \ldots\ldots 24$$

From the above table 4.5 presented, the long run cointegrating vector indicates that $LNRGDP, LNNS\ and\ LNINV$ have the positive sign and statistically significant on economic growth whereas LNIR have negative and statistically significant effect on LRGDP.

The normalizing equation economic growth with respect to lagged National Saving (NS) is statistically significant and positive relationship with explaining economic growth in the long run by one percent increase with increase in economic growth by 0.137175 percent on average ceteris paribus.

The economic growth with respect to lagged domestic Investment (NIV) by one percent increase with increase in economic growth by 0.230563 percent on average. The positive sign of National Saving and Investment shows that the long-run impact on Economic growth. However, from the above normalized equation relationship between economic growth and lagged Interest rate was found to be negative. That is a 1percent increase in interest rate leading to a decline in economic growth by 0.549215 percent on average in the long run.

The relationship between economic growth and lagged gross capital formation was found to be positive. That is a 1.0 percent increase in gross capital formation increasing in economic growth on average by 0.518943 percent in the long run.

The economic growth with respect to lagged labor force by one percent increase with increase in economic growth by 5.693 percent on average and inflation also increase by one-unit economic growth increase by 0.0064 percent on average. The positive sign of labor force and inflation shows that the long-run impact on Economic growth.

Abel Mesfin Hailu (2016) Negative national saving coefficient for Ethiopia might interpret as the high capital outflow. Ethiopia depends heavily on foreign aid and borrowing to meet its investment requirements. There is less saving and the economy depends on external resources to meet the investment requirements. The current account deficits are common in Ethiopia, and this usually balanced by foreign aid and, or borrowing, (Gebreyehu, 2010) finds no statistically significant causality between savings and investment. Capital formation which is proxied by gross investment has a positive impact on Ethiopian economic growth

and statistically significant at 1 percent significance level. This study's result is consistence with study of (Biswas and Saha, 2014) in India and (Tasdesse, 2011) in Ethiopia.

4.6. The Vector Error Correction Model

This vector error corrections model is a restricted VAR model that has cointegration restrictions built in to the specification. It is designed for use with non-stationary series that are known to be cointegrated. The vector error corrections specification restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short-run dynamics. The cointegrating term [the error correction term] corrects the deviation from long-run equilibrium gradually through a series of partial short run adjustments.

Short Run Relationship

The short run model table 4.6 gives the model underestimation and empirical model for the study. The dynamic growth model results (table 4.6) explain the relationship between saving and investment (saving, interest rate, investment, gross capital formation, labor force and inflation) and economic growth in Ethiopia. It would not that most of the coefficient of variables exhibited the expected sign and were significant at 5% levels respectively.

As to the interest rate and inflation the coefficient is statistically significant and negative. implying that one percent increase in interest rate leading to a decline in economic growth on average by 4.5 percent in the short run and the inflation also by one unit increase leading to decline the economic growth by 0.12 percent on average in the short run. This may be due to the fact that Ethiopia is people save in bank and get interest rate, the investing on consumption decreases and inflation increase.

The co-efficient of the lagged values of interest rate and inflation on were observed to be negative and significant on the relationship between saving and investment and insignificant;

this is consistent with a priori expectation. Because, saving and labor force has positive and investment has negative and in significant effect on economic growth in the short run.

The error correction term (ECTt-1) coefficient for the economic growth equation is negative and statistically significant at 1% significance level and indicating the existence of long-run relationship amongst the growth model variables. This agreement that although economic growth may temporarily deviate from its long run equilibrium value, it would gradually reach to its equilibrium after a shock. This implies that in the event of a deviation between actual and long run equilibrium level, there would be an adjustment back to the long-run relationship in subsequent periods to eliminate this inconsistency.

The error correction term (ECTt-1) has important implication in linking the short-run periods to the long run period. It represents the adjustment of the short-run disequilibrium to achieve a long-run equilibrium. Its coefficient is negative and statistically less than one in absolute value. This is the expected sign for the stability of a long-run relationship. A stable cointegrating relationship adjusts the short-run deviations by the extent of the error correcting term. The finding in table 4.6 shows that the lag of GDP growth adjusts itself by 24.2% each year to its equilibrium value and it is expected to achieve equilibrium takes almost 4 years.

Since Durbin-Watson statistics is greater than R-squared we accept the model. Speed of adjustment to wards long run equilibrium but it must be significant and the sign must be negative.
R2 is 47.68% which indicate that the fitted value explains the model well, indicates 47.68% of the growth in lagged real GDP is explained by the variables included in the regression. The F-test which shows the jointly significant at 5% level of significance. Moreover, the overall significance (F-test) established all variables are jointly significant.

The adjusted R-square shows that 32.73% of the variation in LGDP growth is explained by the combined effects of all the determinants of LGDP in the short-run. The log of GDP growth can be motivated by activating two period lagged active labour forces and interest rate also significant in generating change in economic growth in the short-run [table 4.6]. The growth rate of current log of GDP is affected by changes in active labour forces and interest

rate made before two years and also a year before for the latter. However, have opposite sign in active labour forces compared to its long-run-relationship with log of GDP growth.

Table 4.6: Short-Run coefficients

Dependent Variable: D(LNRGDP)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Sample (adjusted): 3 39
Included observations: 37 after adjustments
D(LNRGDP) = C(1)*(LNRGDP(-1) - 0.518942941587*LNGCF(-1) - 0.137175435979*LNINTR(-1) - 0.0285708955035*LNINVE(-1) + 0.549214889402*LNSAV(-1) - 5.6926994141*LNTLF(-1) - 0.00642143828775*INFL(-1) + 0.0443255549754*@TREND(1) + 36.5744797062) + C(2)*D(LNRGDP(-1)) + C(3)*D(LNGCF(-1)) + C(4) *D(LNINTR(-1)) + C(5)*D(LNINVE(-1)) + C(6)*D(LNSAV(-1)) + C(7) *D(LNTLF(-1)) + C(8)*D(INFL(-1)) + C(9)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.241635	0.071270	-3.390404	0.0021
C(2)	0.521777	0.176058	2.963665	0.0061
C(3)	0.078638	0.060736	1.294737	0.2060
C(4)	-0.045082	0.021140	-2.132550	0.0419
C(5)	-0.001647	0.004375	-0.376430	0.7094
C(6)	0.010761	0.057417	0.187422	0.8527
C(7)	0.243635	0.996744	0.244431	0.8087
C(8)	-0.001235	0.000376	-3.281333	0.0028
C(9)	0.004783	0.012211	0.391709	0.6982

R-squared	0.476774	Mean dependent var	0.024074
Adjusted R-squared	0.327280	S.D. dependent var	0.025797
S.E. of regression	0.021159	Akaike info criterion	-4.665737
Sum squared resid	0.012536	Schwarz criterion	-4.273892
Log likelihood	95.31614	Hannan-Quinn criter.	-4.527593
F-statistic	3.189265	Durbin-Watson stat	1.527096
Prob(F-statistic)	0.010630		

4.7. Diagnostic tests on the residual of the vector error correction model

The diagnostic tests from annex 2 including normality test by Jacque Bera, Serial correlation by Breusch-Godfrey serial correlation LM test and Presample missing value lagged residuals, and Heteroscedasticity test by: Breusch-Pagan-Godfrey are not failed to reject the entire above null hypothesis at 5% significant level. All the tests show that the model has the desired econometric properties, i.e., it has a correct functional form and the model's residuals are serially uncorrelated, normally distributed and homoscedasticity. Therefore, the results reported are valid and reliable for interpretation. Look at Appendix (2), appendix (3) and Appendix (4)

4.7.1. Granger Causality Test

The finding of stationarity of the variables and co integration between Saving and investment with real gross domestic product immediately implies that there is long-run causality in at least one direction (Granger 1988), either from saving and investment to gross domestic product or vice versa. Therefore, it would be useful to test long-run non-causality if co integration is found that the result of the long run causality between saving and economic growth.

Table 4.7: Chi-square statistics and respective p-value for Granger Causality test

Pairwise Granger Causality Tests
Sample: 1981 2019
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LNNSAV does not Granger Cause LNRGDP	38	1.94353	0.1721

LNRGDP does not Granger Cause LNNSAV		14.9334	0.0005
LNINVES does not Granger Cause LNRGDP	38	2.94294	0.0951
LNRGDP does not Granger Cause LNINVES		4.58257	0.0393
LNINTR does not Granger Cause LNRGDP	38	2.22738	0.1445
LNRGDP does not Granger Cause LNINTR		0.12870	0.7219
LNGCF does not Granger Cause LNRGDP	38	2.07420	0.1587
LNRGDP does not Granger Cause LNGCF		13.3415	0.0008
LNINVES does not Granger Cause LNNSAV	38	0.78549	0.3815
LNNSAV does not Granger Cause LNINVES		3.70104	0.0625
LNGCF does not Granger Cause LNNSAV	38	4.25700	0.0466
LNNSAV does not Granger Cause LNGCF		0.00154	0.9689
LNTLF does not Granger Cause LNNSAV	38	11.1812	0.0020
LNNSAV does not Granger Cause LNTLF		0.27077	0.6061
LNGCF does not Granger Cause LNINVES	38	3.23352	0.0808
LNINVES does not Granger Cause LNGCF		1.07317	0.3073
LNTLF does not Granger Cause LNINVES	38	8.15425	0.0072
LNINVES does not Granger Cause LNTLF		0.40417	0.5291
INFLATION does not Granger Cause LNINTR	38	2.88850	0.0981
LNINTR does not Granger Cause INFLATION		6.61057	0.0145
LNTLF does not Granger Cause LNGCF	38	7.12817	0.0114
LNGCF does not Granger Cause LNTLF		0.14808	0.7027

Granger causality test is used to examine the relationship between the variables included and the relevance of using a VAR model. If the variables are endogenously related to each other in the system, the use of a VAR model is valid. The test shows whether any variable granger causes the other variable in the system and/or vice versa. It helps to test whether economic growth has got an impact on the Investment, Saving, inflation, labor force, gross capital formation and interest rate in the country and vice versa.

The causality between real GDP and national saving is uni-directional indicating that economic growth as the cause for national saving and also economic growth have uni-directional effect on investment during the study period. This study is also consistent with the finding of (Mohan, 2006). Many theoretical and empirical studies confirm that saving and investment on economic growth have positive impact, results of the present study

show that there is not enough evidence to confirm that saving Granger causes the growth of GDP in Ethiopia.

Saving and Investment have unidirectional causality running from economic growth to Investment and the vice versa is not true. For the case of Ethiopia, investment play a major role in contributing to economic growth; the investment increase in a country in short or in long run have major effect. This implies that the conventional wisdom that higher level of investment leads to economic growth affect positively hold in Ethiopia.

Annex 5 Show that causal relationship between Interest rate, saving and Investment on economic growth of the country was analyzed with the application of Granger (1969) causality test.

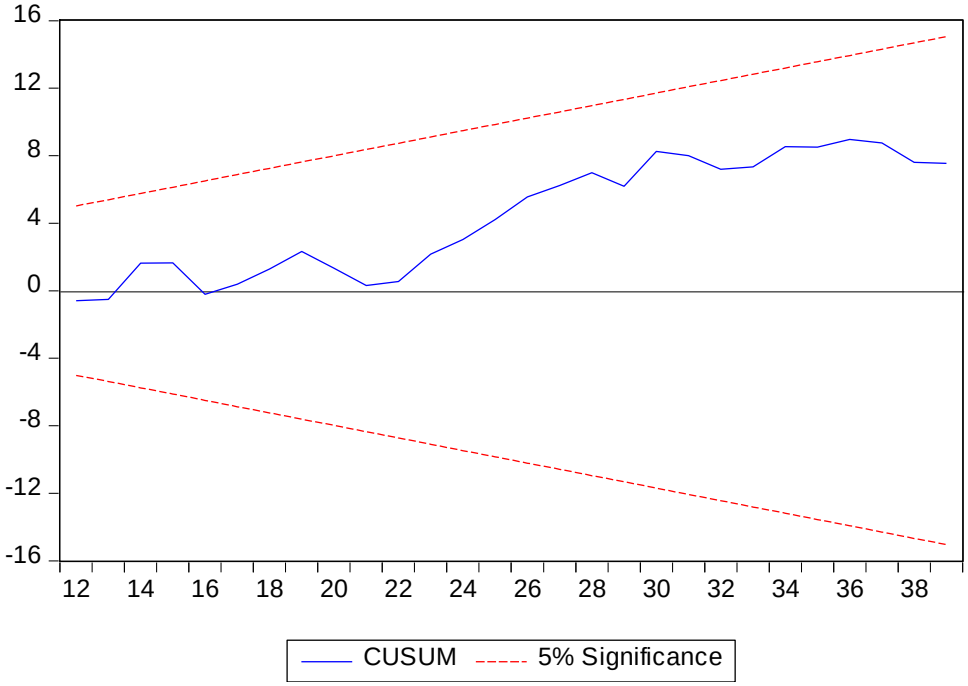
4.8. Model Stability – The CUMSUM test

The last step but not the least steps in the Johnson estimation is that the stability of the model. In words, it is very indispensable to test for parameters stability. The structural stability of the long-run and short-run relationships for the entire period is better examined by the cumulative sum (CUMSUM) and the cumulative sum of squares (CUMSUMSQ) of the recursive residual test as to assess the given parameter consistency.

The CUSUM test uses the cumulative sum of recursive residuals based on the first n and is updated recursively and plotted against the points. The CUSUMSQ makes use of the squared recursive residuals and follows the same procedure. If the plot of the CUSUM and CUSUMSQ stays within the 5 percent critical bound the null hypothesis that all coefficients are stable cannot be rejected. If however, either of the parallel lines are crossed then the null hypothesis (of parameter stability) is rejected at the 5 percent significance level. Figure 4 evidently shows that the CUSUM and plot lie within the 5 percent critical bound thus providing evidence that the parameters of the model do not suffer from any structural instability over the entire period of study. In conclusion, the model stability test using cumulative sum (CUMSUM) of both in short run and long run

control chart also confirmed that the null hypothesis of parameter stability cannot be rejected at the 5% critical bound. Thus, the parameters of the estimated employment model do not suffer from any structural instability over the period of study.

Figure Plot of Cumulative Sum of Recursive Residuals



4.9. Variance Decomposition of VECM model

The variance decomposition separates the variation in an endogenous variable in to the component shocks to the VECM. The relative importance each random innovation in affecting the variables in the VECM can be seen by the variance decomposition results. It highlights the proportion of the movements in the dependent variables that are results of their own shocks, against shocks from the other variables.

Table 4.9.1 reports the results of the variance decomposition of output growth in Ethiopia within a 10-period horizon. The variance estimates indicate that a greater proportion of the variation in LRGDP is due to its own innovations. The variation due to the other variable is smaller. In the short run, that is quarter 3 impulses, innovation, or shock to

LRGDP account for 96.21 percent variation of the fluctuation in LRGDP. Whereas, the other six variables together explain approximately 3.79 % on average in Ethiopian RGDP.

When we look partial effect of factor inputs, LNTLF (1.823) as percent of LNRGDP, LNNSAV (1.6366%), LNINVES (0.13284%), LNINTR (0.4384%), LNGCF (0.804%), of future changes in LNRGDP are due to changes in LNGCF, showing it has less important impact on future growth rate of output in Ethiopia. LNTLF, LNNSAV, LNINVES, LNINTR and LNGCF have permanent effects over all period.

The relatively high-level contribution of Nexus Among Interest Rate, Domestic Saving, Investment to Economic Growth of Ethiopia may be suggest that the relationship between labor force and saving to economic growth is relatively high when compared to investment, interest rate and gross capital formation.

The finding evidence shows that LNTLF and LNNSAV may be relatively more important input than investment, interest rate and gross capital in Ethiopia in the long run. This may be due to the fact that in Ethiopia, investment infrastructure quality and durability is very low, it may be uses for few years, our result suggests that in order to sustain high economic growth rates in the long run, the country expected to save more build all rounded labor force.

Table 4.9 Decomposition of VECM model

Variance Decomposition of LNRGDP LNTLF LNNSAV LNINVES LNINTR LNGCF

Period	S.E.	LNRGDP	LNTLF	LNNSAV	LNINVES	LNINTR	LNGCF
1	0.657389	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.117558	90.55328	4.145952	3.152909	0.356633	0.497577	1.293653
3	12.10095	96.21199	1.044264	1.546457	0.070575	0.409701	0.717011
4	53.71837	94.60998	2.267333	1.673764	0.171474	0.436498	0.840950
5	266.7470	95.38984	1.653407	1.618924	0.116366	0.434914	0.786550
6	1261.326	95.07724	1.894378	1.640581	0.139398	0.438368	0.810034
7	6083.052	95.20398	1.790963	1.635278	0.129976	0.438317	0.801487
8	29098.64	95.15257	1.833356	1.637106	0.133759	0.438409	0.804804
9	139663.5	95.17383	1.815844	1.636323	0.132200	0.438395	0.803407
10	669414.2	95.16515	1.823009	1.636630	0.132842	0.438402	0.803970
	S.E.	LNRGDP	LNTLF	LNNSAV	LNINVES	LNINTR	LNGCF

Period

1	0.008512	3.147477	96.85252	0.000000	0.000000	0.000000	0.000000
2	0.070001	97.91405	1.680622	0.004569	0.005009	0.395273	0.000473
3	0.227194	90.11391	5.415491	2.632041	0.334001	0.361107	1.143448
4	1.385150	96.56525	0.849046	1.473936	0.059382	0.399773	0.652613
5	6.101091	94.55899	2.337445	1.658735	0.178667	0.428279	0.837883
6	30.41259	95.40975	1.620888	1.632657	0.115075	0.435057	0.786573
7	143.5860	95.06604	1.904751	1.640471	0.140104	0.437798	0.810835
8	693.0328	95.20917	1.786999	1.634979	0.129581	0.438173	0.801099
9	3314.217	95.15077	1.834936	1.637125	0.133890	0.438370	0.804914
10	15909.07	95.17460	1.815188	1.636310	0.132143	0.438391	0.803365

Period	S.E.	LNRGDP	LNTLF	LNNSAV	LNINVES	LNINTR	LNGCF
1	0.238917	5.424329	6.515956	88.05971	0.000000	0.000000	0.000000
2	2.891262	99.26351	0.105158	0.610331	0.006884	0.011701	0.002421
3	13.05341	94.74056	2.234595	1.782464	0.191077	0.263430	0.787873
4	69.47409	95.75743	1.318394	1.674103	0.088786	0.385355	0.775935
5	323.5541	94.97676	1.969728	1.656935	0.148852	0.426532	0.821194
6	1573.900	95.25639	1.749813	1.635503	0.125017	0.434703	0.798579
7	7506.948	95.13390	1.849533	1.637791	0.134931	0.437638	0.806206
8	36078.82	95.18219	1.809197	1.635892	0.131565	0.438235	0.802922
9	172836.9	95.16182	1.825773	1.636748	0.133074	0.438381	0.804205
10	829064.5	95.17008	1.818935	1.636458	0.132476	0.438397	0.803656

Period	S.E.	LNRGDP	LNTLF	LNNSAV	LNINVES	LNINTR	LNGCF
1	1.845440	11.17196	1.130794	3.527055	84.17019	0.000000	0.000000
2	5.764558	89.31492	0.117427	1.141274	8.752178	0.373551	0.300648
3	23.79569	93.96409	2.123321	1.803729	0.918474	0.366750	0.823639
4	122.6264	95.42336	1.473973	1.681120	0.109796	0.444861	0.866887
5	564.9765	94.87183	1.995718	1.686595	0.148656	0.445534	0.851668
6	2739.936	95.23934	1.764374	1.632088	0.124963	0.437417	0.801816
7	13066.63	95.13374	1.850456	1.636558	0.134830	0.438277	0.806141
8	62787.83	95.18090	1.810037	1.635980	0.131671	0.438426	0.802984
9	300794.7	95.16195	1.825603	1.636744	0.133084	0.438435	0.804185
10	1442828.	95.16997	1.819024	1.636459	0.132486	0.438406	0.803658

Period	S.E.	LNRGDP	LNTLF	LNNSAV	LNINVES	LNINTR	LNGCF
1	0.151484	5.003830	26.47217	1.080949	16.81825	50.62480	0.000000
2	1.091962	96.91294	0.677567	0.271623	0.609498	1.473609	0.054764
3	3.653958	91.29464	5.539510	1.752669	0.224929	0.393802	0.794446
4	21.04167	96.30631	0.969587	1.581579	0.090342	0.414560	0.637623
5	95.30385	94.74490	2.204905	1.635072	0.157580	0.426965	0.830577
6	470.8764	95.36307	1.665902	1.629194	0.118696	0.434531	0.788610
7	2232.631	95.09694	1.880966	1.638065	0.138101	0.437559	0.808364
8	10756.43	95.19718	1.796001	1.636162	0.130389	0.438213	0.802053
9	51477.31	95.15548	1.831046	1.636936	0.133548	0.438373	0.804619
10	247028.0	95.17265	1.816808	1.636373	0.132283	0.438391	0.803492

Period	S.E.	LNRGDP	LNTLF	LNNSAV	LNINVES	LNINTR	LNGCF
1	0.176318	2.294344	0.101486	74.29288	2.204452	0.100757	21.00609
2	1.610815	98.67756	0.013880	0.991320	0.045512	0.017564	0.254167

3	6.384910	93.37768	3.029891	2.102503	0.206695	0.276299	1.006936
4	34.92577	95.88580	1.185923	1.697677	0.076168	0.383327	0.771104
5	159.5787	94.82860	2.085415	1.663974	0.159881	0.429922	0.832212
6	782.2987	95.30551	1.714151	1.630362	0.121382	0.434416	0.794181
7	3719.851	95.11430	1.865862	1.638290	0.136466	0.437721	0.807358
8	17901.08	95.19041	1.802441	1.635560	0.130981	0.438230	0.802374
9	85709.84	95.15842	1.828532	1.636904	0.133325	0.438389	0.804428
10	411223.4	95.17146	1.817793	1.636409	0.132374	0.438395	0.803565

Cholesky Ordering: LNRGDP LNTLF LNNSAV LNINVES LNINTR LNGCF

Source: EViews version 9 using National Bank data 2019

CHAPITER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The study the mean value of log of real Gross domestic product around 12.30454 units over the period 1981/82-2019/20 in Ethiopia. The real Gross domestic product fluctuates between 8103.0839 to 958643.746. This implies that real Gross domestic product in most

years approaches to the means. The minimum value of RGDP in the study period was 2019 and high interest rate. This value implies that there was instability in the country.

This study was analyze the relationship between Saving, Investment and interest rate on economic growth and their causality in Ethiopia, during the specified study period. To determine the long run and short run relationship among the variables, Vector Error Correction (VEC) model was applied.

Before applying the VEC model, all the variables are tested for their time series properties (stationarity properties) using the ADF and PP. Moreover, pairwise Granger causality test also applied in order to find out the directional causation between national saving, Investment, Interest rate, labor force, inflation, gross capital formation and economic growth. Real GDP and the explanatory variables are stationary and all the variables are stationary in first difference.

The study found that in the long run investment have positive and relationship between RGDP, quality of infrastructure, considering for the long-term service. From the findings, components of the study have favorable impacts on economic growth in long run. The study also found that the short run relationship is the negative relationship between in the interest rate and inflation on economic growth in Ethiopia in the study period. The contribution of inflation and interest rate have expected to influence economic growth in this study to be negative in short run.

National Saving (NS) is statistically significant and positive relationship with explaining economic growth in the long run by one percent increase with increase in economic growth by 0.137175 percent on average ceteris paribus and the economic growth with respect to lagged Investment (NIV) by one percent increase with increase in economic growth by 0.230563 percent on average. The positive sign of Saving and Investment shows that the long-run impact on Economic growth. However, from the long run equation relationship between economic growth and lagged Interest rate was found to be negative. That is a 1percent increase in interest rate leading to a decline in economic growth by 0.549215 percent on average in the long run.

The study carried out the model stability tests and the result shown that no evidence of serial correlation, no functional form problem (the model is correctly specified), the residual is normally distributed and no evidence of Heteroscedasticity problem.

The study found that the causality between real GDP and national saving is uni-directional indicating that economic growth as the cause for national saving and also economic growth have uni-directional effect on investment during the study period. The study is also consistent with the finding of (Mohan, 2006)

While many theoretical and empirical studies confirm the positive impact of saving and investment on economic growth, results of the present study show that there is not enough evidence to confirm that saving Granger causes the growth of GDP in Ethiopia. The study also does find an evidence of reverse causality for the case of Ethiopia. This implies that wisdom of saving leads to economic growth hold positively in Ethiopia.

Saving and Investment have unidirectional causality running from economic growth to Investment and the vice versa is not true. For the case of Ethiopia, investment play a major role in contributing to economic growth; the investment increase in a country in short or in long run have major effect. This implies that the conventional wisdom that higher level of investment leads to economic growth affect positively hold in Ethiopia.

5.2. Recommendation

The policy implications that stem from these results are important. This study recommends more invest in saving and investment rather than increasing interest rate. So that economic growth can be further accelerated, that in turn, leads to further investment and hence economic growth.

Whereas, increasing government expenditure on education to make technically and academically well lobar force with a view to increasing education quality. Investment policy that focuses on the provision of facilities aimed at improving the problems of society in increasing the commercialization of farmers initiating investors to invest in

durable and time schedule. Parallel the government and responsible body should give awareness to deposit their money in bank rather than at home for the society and increase financial sector in appropriate place.

The researcher strongly recommends that to ensure sustainability of economic growth need to emphasis on Improve of labor force toward skill development. The labor force by one percent increase with increase in economic growth by 5.693 percent on average and positive, the positive sign of labor force shows that the long-run impact on Economic growth. There is positive relationship between interest rate, domestic saving and investment on economic growth, from the context of Ethiopia. But it also has its own limitations and those limitations can be addressed by researchers in future. Hence the researcher suggests future researchers to change their attention to study on relationship between saving, investment and interest rate with economic growth in Ethiopia. In the household level (helps to fully understand the behavior of saving in Ethiopia) and in overall country level government should invest more on quality of investment.

REFERENCE

Abay (2010), Domestic Resource Mobilization in Sub-Saharan Africa the Case of Ethiopia by, University of Addis Ababa, Ethiopia

Abu, N. (2010). Saving –Economic Growth Nexus in Nigeria, 1970-2007: Granger Causality and Co- Integration Analyses," Review of Economic & Business Studies, Vol. 3, p. 93-104.

Abel Mesfin Hailu(2016)The Relationship between National Saving and Economic Growth in Ethiopia: ARDL and Granger causality Approaches

Aghion and et al., 2006 show that savings is significantly associated with higher levels of FDI inflows and equipment imports and the effect on growth is significantly larger for poor countries than rich

Alexia Prskawetz, Thomas Fent, Werner Barthel /the Relationship between Demographic Change and Economic Growth in the EU Research Report 32/ July 2007.

Anis Omri, Bassemkahouli (2013) the nexus among foreign investment, domestic capital and economic growth: Empirical evidence from the MENA region

Akshaya Kumar Mohanty (2017), Does Domestic Saving Cause Economic Growth? Time-Series Evidence from Ethiopia."

Bawa Sanai and S. Abdullahi Ismaila (2010), Threshold Effect of Inflation on Economic Growth in Nigeria", CBN Journal of Applied Statistics.

Barro, R. J. (2004), Government Spending in a Simple Model of endogenous Growth. Journal of Political Economy.

Biswas Sreelata and Saha,Anup Kumar (2014), "Macroeconomic Determinants of Economic Growth in India: A Time series Analysis", Sop Transactions on Economic Research, Vol.1, No.2, JUNE 2014

Brooks, C. (2008). Introductory Econometrics for Finance, 2nd ed., Cambridge University Press, New York.

Chaudhry, I. S., Faridi, M.Z., Abbas, M., and Bashir, F. (2010). Short Run and Long Run Saving Behavior in Pakistan: An Empirical Investigation. Journal of Money, Investment and Banking, 16, 57-66.

Christopher D. Carroll and David N. Weil (1994) saving and growth: a reinterpretation, CarnegieRochester Conference Series on Public Policy 40 (1994) 133-192, North-Holland

Daniel L. Thornton. (2009) short essays and reports on the economic issues of the day/ Economic Synopses Federal Reserve Bank of St. Louis 2 Dipendra.

Dhanya Jagadeesh (2015) The Impact of Savings in Economic Growth: An Empirical Study Based on Botswana/International Journal of Research in Business Studies and Management.

Dipendra, S. (2009). "Saving and Economic Growth in India", Munich Personal RePEc Archive,Vol. 199, p. 1-18

Engle, R.F. and C.W.J., Granger (1987)." Co-Integration and Error Correction : Representation

G. m. Sajid and Mudassira Sarfraz, (2008) savings and economic growth in Pakistan: an issue of causality, pakistan economic and social review

Loayza, Norman; Klaus Schmidt-Hebble; and Luis Serven. 2000. What Drives Private Saving around the World? The Review of Economics and Statistics.

Hassen Beshir (2017) Factors Affecting Savings as Means of Economic Growth in Ethiopia

Hemmi, N. et al. (2007). "The Long-Term Care Problem, Precautionary Saving, and Economic Growth, "Journal of Macroeconomics, Vol 29, p. 60–74.

Kazmi. (1993). National Savings Rate of India and Pakistan: A Macroeconometric Analysis. The PakistanDevelopment.

Klaus Schmidt and Anderes Solimano 1996, Saving, investment, and growth in developing countries.

Masih and Peters, 2010 studied the mutual relation between savings and economic growth in Mexico using a Vector Auto-Regressive (VAR) method and annual data from 1960 to 1996. They concluded that savings have a positive effect on economic growth.

Mohamed, S. A. E. (2014), Testing the relationship between Private Savings and Economic Growth in Bahrain. Global Journal of Commerce and Management Perspective,

. Narayan, P.K. and Siyabi, S.A. (2005). An empirical investigation of the determinants of Oman"s national savings. Economics Bulletin, 51(3), 1-7.

Nwanne, T. F. I. 2014, Implication of Savings and Investment on Economic Growth in Nigeria.

Odhiambo, N, M. (2008). " Financial Depth, Savings and Economic Growth in Kenya: A Dynamic Causal Linkage," Journal of Policy Modeling, Vol 31, p. 708–718.

Odhiambo, M. (2009). "Savings and Economic Growth in South Africa: A Multivariate Causality Test," Journal of Policy Modeling, Vol 31, p. 708–718.

Philippe Aghion, Diego Comin, Peter Howitt, Isabel Tecu (2009) When Does Domestic Saving Matter for Economic Growth? /Harvard business school/Working Paper 09-080.

Piotr Misztal 2011, The Relationship Between Savings and Economic Growth in Countries with Different Level of Economic Development

Romer, P. (1989). "Capital Accumulation and the Theory of Long Run Growth, in Modern Business Cycle Theory, (Ed.) R. Rana (Harvard University

Schultz, T. P. (2004). Demographic Determinants of Savings: Estimating and Interpreting the Aggregate Association in Asia. IZA Discussion Paper.

Serhan Ciftcioglu, Nermin Begovic (2010) Problems and Perspectives in Management, Volume 8, Issue 3, 2010/Are domestic savings and economic growth correlated?, Evidence from a sample of Central and East European countries.

Shimelis, K. H. (2014), Savings, Investment and Economic Growth in Ethiopia: Evidence from ARDL approach to co-integration and TYDL granger causality tests. Journal of Economics and International Finance,

The World Bank(1994) Policy Research Department 'Macroeconomics and Growth Division

Tizita Gebeyehu (2016) Determinants of Private Saving in Ethiopia

(Johansen Co-Integration Approach)

Vittorio, C., & Hebbel, S. (1991). Public policies and saving in developing countries. Journal of Development Economics, 89-115

Worku Gebeyehu 2011, Causal Links Among Saving, Investment and Growth and Determinants of Saving in Sub-Saharan Africa: Evidence from Ethiopia

World Bank (2013), Ethiopian Economic update, A World Bank Policy Research Report, Oxford University Press.

APPENDIX

ANEX1: Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.376474	Prob. F(3,25)	0.2729
Obs*R-squared	5.245163	Prob. Chi-Square(3)	0.1547

Serial correlation is one mechanism of checking the for analysis. From Appendix-1 as it is shown here the p- value is greater than 5% (15.47) so we fail to reject the null hypothesis which says that there is no serial correlation.

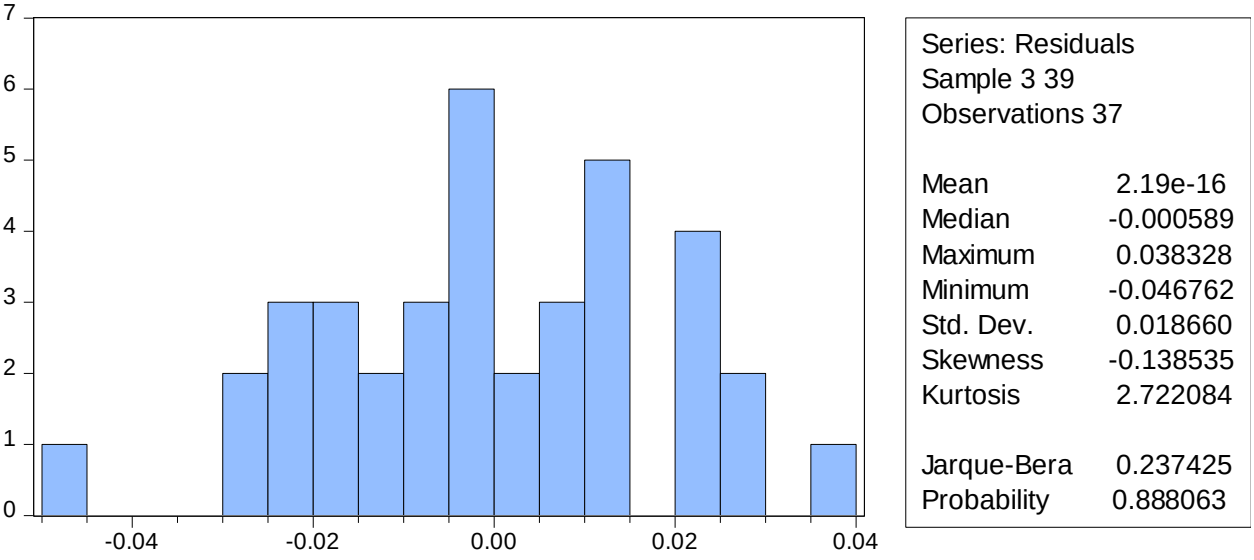
ANEX2: Heteroscedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.233701	Prob. F (14,22)	0.3201
Obs*R-squared	16.27266	Prob. Chi-Square (14)	0.2970
Scaled explained SS	8.024085	Prob. Chi-Square (14)	0.8881

As it is shown in appendix-3 there is no hetroskedasticity since the P-value is greater than 5% that is (29.70). Therefore, we fail to reject the null hypothesis which says that there is no heteroskedasticity.

ANEX3: Normality Test



From this normally distributed for the period of study since the P-value is greater than 5% (88.80)

ANEX 4: Granger Causality Tests

Pairwise Granger Causality Tests

Sample: 1981 2019
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LNNSAV does not Granger Cause LNRGDP	38	1.94353	0.1721
LNRGDP does not Granger Cause LNNSAV		14.9334	0.0005
LNINVES does not Granger Cause LNRGDP	38	2.94294	0.0951

LNRGDP does not Granger Cause LNINVES		4.58257	0.0393
LNINTR does not Granger Cause LNRGDP	38	2.22738	0.1445
LNRGDP does not Granger Cause LNINTR		0.12870	0.7219
LNGCF does not Granger Cause LNRGDP	38	2.07420	0.1587
LNRGDP does not Granger Cause LNGCF		13.3415	0.0008
INFLATION does not Granger Cause LNRGDP	38	0.02247	0.8817
LNRGDP does not Granger Cause INFLATION		2.80751	0.1027
LNTLF does not Granger Cause LNRGDP	38	2.02090	0.1640
LNRGDP does not Granger Cause LNTLF		0.42156	0.5204
LNINVES does not Granger Cause LNNSAV	38	0.78549	0.3815
LNNSAV does not Granger Cause LNINVES		3.70104	0.0625
LNINTR does not Granger Cause LNNSAV	38	0.73840	0.3960
LNNSAV does not Granger Cause LNINTR		0.01696	0.8971
LNGCF does not Granger Cause LNNSAV	38	4.25700	0.0466
LNNSAV does not Granger Cause LNGCF		0.00154	0.9689
INFLATION does not Granger Cause LNNSAV	38	1.02558	0.3181
LNNSAV does not Granger Cause INFLATION		2.71157	0.1086
LNTLF does not Granger Cause LNNSAV	38	11.1812	0.0020
LNNSAV does not Granger Cause LNTLF		0.27077	0.6061
LNINTR does not Granger Cause LNINVES	38	1.93058	0.1735
LNINVES does not Granger Cause LNINTR		0.00052	0.9819
LNGCF does not Granger Cause LNINVES	38	3.23352	0.0808
LNINVES does not Granger Cause LNGCF		1.07317	0.3073
INFLATION does not Granger Cause LNINVES	38	1.57956	0.2171
LNINVES does not Granger Cause INFLATION		0.12977	0.7208
LNTLF does not Granger Cause LNINVES	38	8.15425	0.0072
LNINVES does not Granger Cause LNTLF		0.40417	0.5291
LNGCF does not Granger Cause LNINTR	38	0.01218	0.9128
LNINTR does not Granger Cause LNGCF		0.19091	0.6648
INFLATION does not Granger Cause LNINTR	38	2.88850	0.0981
LNINTR does not Granger Cause INFLATION		6.61057	0.0145
LNTLF does not Granger Cause LNINTR	38	0.06316	0.8030
LNINTR does not Granger Cause LNTLF		0.98332	0.3282
INFLATION does not Granger Cause LNGCF	38	0.00340	0.9539
LNGCF does not Granger Cause INFLATION		2.27820	0.1402
LNTLF does not Granger Cause LNGCF	38	7.12817	0.0114
LNGCF does not Granger Cause LNTLF		0.14808	0.7027

LNTLF does not Granger Cause INFLATION	38	2.60239	0.1157
INFLATION does not Granger Cause LNTLF		0.00039	0.9843