Global Scientific JOURNALS

GSJ: Volume 7, Issue 4, April 2019, Online: ISSN 2320-9186
www.globalscientificjournal.com

THE CAUSAL RELATIONSHIP BETWEEN SAVING AND INVESTMENT IN ETHIOPIA

NATIONAL BANK OF ETHIOPIA

DOMESTIC ECONOMIC ANALYSIS AND PUBLICATION DIRECTORATE

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JUNE, 2018

ADDIS ABABA, ETHIOPIA

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ABSTRACT

Interaction between saving and investment has been a major concern to the economists and there exists substantial debate over the nature of long run relationship between them. Thus, the main objective of this paper is to examine the dynamic linkages between saving and investment in Ethiopia using annual time series data covering the period from 1980 to 2016. The stationarity of the data is examined by using the Augmented Dickey-Fuller (ADF) and Johansen co integration test. This paper applied the Johansen co integration test to examine the long run relationship between saving and investment and have long run positive and significant impact on the Ethiopia economy. In order to show the direction of causal relationship between saving and investment, the widely used Granger causality test has been used. The unit root tests revealed that both saving and investment are non-stationary at level forms and they become stationary after taking their first difference. The Johansen co integration test analysis suggests that, there exists a long run relationship between saving and investment as it is confirmed by both the Trace and Maximum Eigen-value test statistics. Results found from the Granger causality test suggests that bidirectional causality running from saving to investment existed in Ethiopia over the sample period for a lag length of two periods. Based on the results, pursuance of policy measures towards mobilizing domestic saving is recommended.

I. Introduction

Savings and investment are key requirements for growth and development. Whether saving causes investment or gets caused by investment has been a serious theoretical as well as an empirical debate among the economists Savings and investment has been emphasized by Economists as a precondition for the growth and development of countries. There has been increasing awareness that the faster the rate of investment, the greater the rate of capital formation, which ultimately promote growth and development (Thilwal, 1979). Savings and investment have been considered as two critical macro-economic variables with micro-economic foundations for achieving price stability and promoting employment opportunities thereby contributing to sustainable economic growth.

In Keynes theory argues that an increase in the investment leads to an increase in the output and income which, in turn, will increase savings and which plays role in equalization of saving and investment. The equilibrium of saving and investment is below full employment in the economy. Contrarily, classical theory, an increase in savings will lead to a reduction in the interest rates prompting investors demand more from the available funds and therefore to an increase in investments. When saving exceeds investment the rate of interest falls to discourage saving and encourage investment and vice versa. Economic theory suggests that investment must be funded either from domestic savings, credit extension or foreign capital inflows. However, inadequate savings and investment are common problem in developing countries. For instance, Ethiopian average gross 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 15% in the 2004/05, 9.3% in the 2010/11 and 17% for the period 2012-14 which is lower than the corresponding average GDS to GDP ratio for SSA (Tasew, 2011).Poor performance of the economy, high unemployment level, engagement of a large proportion of the population in the informal sector and low wages are factors responsible for low domestic savings in small developing states.

However, most studies in Ethiopia look at the relationship between savings and investment growth by commonly testing for bi or multi-variate Co integration and Granger causality separately between investment and growth, or between savings and growth and saving investment and growth. This study therefore investigates the possibility of saving and investment relation , illustrates their composition and features in the saving behavior by testing for Granger causality, under a bi-variate framework, between gross domestic savings, investment in Ethiopia and Such studies are either scant or do not exist for Ethiopia. This paper tries to fill this gap and aims to study the causal links between savings and investment in Ethiopia using long period data. The main objective of this papers therefore, to examine the causal relationship among savings and investment in Ethiopia.

The remainder of this paper is organized as follows. Section 2 briefly reviews some of the theoretical and empirical literature regarding the dynamic relationships between saving and investment. Section 3 highlights the econometric framework. , presents the data and empirical results and the last section provide the summary and conclusions of the study.

II. LITERATURE REVIEW

2 Theoretical Literature

Classical economists were of the view that saving and investment are always equal in a fully employed economy, and whenever inequality is arisen between saving and investment, it is brought to equality through a flexible rate of interest. However, according to Keynesian view, the equality between saving and investment is brought about not through the mechanism of rate of interest but through the changes in income. Contrary to the classical view that saving and investment are equal under condition of full employment equilibrium, the Keynesians are of the view that equality between saving and investment can take place below or above the level of full employment. Keynes has put forward two views on saving-investment equality viz., accounting or definitional equality and functional equality. Actual saving and actual investment are always and necessarily equal at any level of income for the community as a whole and in order to prove it, he defined saving in the current period as the excess of income over expenditure. As regards investment, it is the value of current output of capital goods together with the value of any addition to work in progress or the stock of finished goods. Investment is equal to the output of the community minus consumption.

According to the second version of Keynes, saving is equal to investment at the equilibrium level of income. It is brought about by the adjusting mechanism of income compared to the classical view of variations in the rate of interest. Keynes established equality between saving and investment by defining income as equal to current consumption plus current investment. The basic idea of explaining equality between saving and investment is that it is brought about by changes in income and not through the mechanism of interest rate.

According to the functional equality version, when people save more than what the investors think it worthwhile to invest, the demand for consumer and producer goods falls down. When the goods produced are not profitably sold, the entrepreneurs curtail production of goods and national income falls. If investment is more than saving, then national income rises. The process of changes in income, saving and investment continues till saving and investment are in equilibrium.

The relationship between savings and investment is captured through the national account identities which state that national income and output are equal in a closed economy. This can be expressed as:

$$Y \equiv C + S + T = C + I + G \ldots. (1)$$

Where C = consumption, S = private saving, T = taxes, I = investment, and G = government spending.

Equation (1) can be rearranged as:

$$S + (T - G) = I \ldots\ldots. (2)$$

Savings are the difference between what is earned and what is consumed. Therefore, from equation (2) it can be seen that domestic investment is equal to private savings (S) plus government savings (T – G). Government savings are added to private savings to give us national savings (S). Equation (2) can now be expressed as:

$$S = I \ldots\ldots\ldots\ldots (3)$$

Thus the level of investment is constrained by the level of national savings.

In an open economy, exports (X) and imports (M) are added to the national accounts identities which become:

$$S - I = X - M \ldots\ldots\ldots\ldots (4)$$

Equation (4) states that in an open economy, the difference between what a country saves and invests is equal to the balance on the current account of the Balance of Payments.

2.2.1 Classical Theory and Model

In the Classical model, interest rate variations equate domestic savings with investment in a closed economy. In this model, "the interest rate is determined by the demand for and supply of loanable funds" (Rohlf, 2002:3). As savings increase, the supply of funds is in excess of its demand, resulting in a reduction of the price (interest rates) for the funds. Due to the interest rate being both the reward that households receive for saving as well as the price businesses pay to finance investment, a reduction in the interest rate would discourage saving yet encourage investment at the same time (Rohlf, 2002:3). Conversely, low saving rates make loanable funds increasingly scarce, thereby raising interest rates and discouraging investment (Cui, 1998:285). All savings are invested at the equilibrium interest rate, achieving full employment. Savings and investment decisions are independent of each other in that both savers and investors have to actively participate in the market for the equilibrium level of loanable funds and the interest rate to be obtained. These funds are used to replace depreciating capital, as well as to add to existing capital stock (investment). While an agent may use his savings for his own investment purposes, relying on retained earnings has the tendency of perpetuating the existing economic divisions

and hierarchies in the market, which negatively influences small businesses and start-up firms (Cui, 1998:283). Since Classical economists uphold the principle of Say‟s Law which states that supply creates its own demand, hoarding money for personal use removes it from circulation, thereby prohibiting firms from borrowing money for investment purposes (Rohlf, 2001:4). Consequently, total spending may decline as a reduction in investment demand causes aggregate supply to be greater than aggregate demand, though unemployment may not necessarily arise as "wage and price adjustments would compensate for any deficiency in total spending", maintaining full employment (Rohlf, 2002:4).

Neoclassical growth models show how increased savings can lead to higher economic growth through their impact on physical capital. Amongst these growth models include the Solow growth model (1956) and Romer growth model (1986). Solow‟s model (1956) suggests that savings lead to higher growth levels only in the short-run due to the temporary impact that capital formation has on growth. Long-term growth in this model is caused by structural demographic variables (Edwards, 1995). In the Neoclassical model, higher saving rates generate more investment per unit of output than it did before – which will in turn lead to an expansion of capital per worker (Romm, 2005). Given the assumption of constant returns to scale in the model, a higher capital/labour ratio without a corresponding increase in the labour input growth rate will result in diminishing returns to output. Returns, though at a diminishing rate, will increase until the steady-state equilibrium point and the higher capital/labour ratio are equal, after which no more increases in growth will occur. Froyen (2009:415) states that once the new output to capital ratio has reached the long-term growth path, capital formation will have returned to the initial equilibrium rate equal to the growth rate in the labour force. Increasing the savings rate only temporarily increases the growth rate in output for each worker. It does however increase the output level per worker. In the Solow model, the long-run equilibrium growth rate depends on population growth and technological change instead of the savings rate which only has a temporary impact. While the Solow model shows the temporary impact saving has on growth, the Romer (1986) model shows how savings have a permanent impact on growth. In the Romer model, technological change or population growth are assumed to be endogenous to the model instead of exogenous variables as stated in the Solow model (Froyen, 2009). The model has the following equation:

$Y = f(K, L, A)$

Where K is the physical capital used in production, L is the labor input, and A is the level of technology4, which though exogenous in the Solow model, is an endogenous variable in the Romer model.

2.2.2 Neoclassical Theory

Unlike the Classical theory, the Neoclassical model acknowledges that output growth depends on more than just capital accumulation and labour. Utility maximization for individuals and profit maximization for firms play an important part in the equilibrium level of output (Hicks, 1939). Investment decisions are therefore not just based on interest rates, but on the marginal benefits of capital stock. Capital stock in this model is measured by its value rather than its cost.

2.2.3 Keynesian Theory

Unlike the Classical model, aggregate demand drives aggregate supply in the Keynesian model. "The more that consumers, investors, and others plan to spend, the more output businesses will expect to sell and the more they will produce" Rohlf (2002:7). As a result, any disruptions in total spending (aggregate demand) may cause a fall in output and employment. By increasing the saving level beyond the level desired by businesses to invest, output falls below the equilibrium level as spending expectations diminish. The Keynesian model instead supports the view of savings being the result and not the cause of increased investment. Instead of the equilibrium level of savings and investment being determined through interest rate adjustment, it is instead the income level which adjusts to bring savings and investment into equilibrium. The multiplier therefore indicates the marginal effect an increase in the rate of investment has on national income (Lange, 1943:228). The standard formula representing the multiplier impact is given by:

$\Delta Y = \Delta I/ (1-c)$

Where ΔY is change in income, ΔI is a change in investment, and c is the marginal propensity to consume.

2.1.5 Saving and investment definition

Savings is that part of the income which is not spent on consumption. Investment refers to the net increase in the stock of real capital. It is the part of income which is spent to add stock of real capital.

Savings= Income- Consumption

Investment= Income- consumption, assuming that entire savings is invested.

When income increases, savings increase, when savings increase investment also increases. Savings and investment although do not increase proportionately. Therefore, more savings means more investment, which implies increase in production, which leads to more demand for factor inputs, which results in more income, which implies more demand, that leads to more investment leading to rapid economic growth , this again leads to increased saving, and the whole process is cyclical .

Savings also can be defined as income that is not consumed in a particular time period and is therefore viewed as postponed consumption (Strydom, 2007). Prinsloo (2000) describes savings as the amount of resources or income produced in the economy in a given year, which is not consumed immediately, but is rather put to use in a way that will provide returns to the economy in years to come.

2.1.9 Investment

Investment expenditure, also referred to as fixed capital formation, can be defined in the national accounts as acquisition less the disposal of assets intended to be used in the production of other goods and services for a period of more than a year (OECD, 2009). Investment is therefore an asset that is purchased today with the hope that it will generate income in the future. There are two forms of investment, namely, fixed investment as well as financial investment. Fixed investment consists of the purchase of capital such as land and machinery which are used in the production process and which earn increased profits (Myles, 2003). Financial investment on the other hand is the purchase of securities such as bonds and stocks. Public investment as well as private investment makes up a country's total investment spending. Public investment consists of investment expenditure made by the general government and public enterprises (World Bank, 2011) while private investment is investment undertaken by both the business and household sectors. An important question to ask is whether a country should focus on increasing public investment or private investment; which of these contributes more to growth? Khan and Kumar (1997) argue that the share of public investment might be expected to be higher than private investment in developing countries as their need for infrastructural and related capital is greater. They found public investment accounts for nearly half of total investment in developing nations compared with only a fifth of total investment in industrial countries. Investment may in

infrastructure by the public sector is necessary for growth and development since it expands the range of opportunities for and returns on private investment.

2.1.10 Ethiopian experience relating Savings and Investment

Ethiopia, one of the poorest countries in the world, has witnessed broadly, three policy regimes: the imperial regime (prior to 1975), the socialist (or Derge) regime (1975-1991), and the present liberalized regime (1992 onwards). The first regime adopted non-interventionist approach, the second followed rigid inward looking strategy and the third initiated economic reforms to address the long-term structural problems of under development. Beginning in 1992, the Ethiopian government began to implement an economic reform program with a view to revive the economy. Various policy measures, some homebred, others imposed by the IMF and the World Bank, have been undertaken (Sukar and Ramakrishna, 2002). The data are rearranged to represent the above mentioned sub periods broadly. The data for the period, 1981-2015 exhibits a wide gap between gross domestic savings (GDS) and gross domestic investment (GDI) in Ethiopia. However, during 1988, Ethiopia has registered an exceptionally high saving rate (18 %). The share of total investment in the GDP for the same period is found to be 28%, while the minimum being 12 % (1992) and a maximum 37% in 2015). The resource gap (measured as the difference between I and S) is about 22 % during this period and reached a maximum of 31 % during 2014/15.

2.2 Empirical Literature

In this section, the different economic theories provide their interpretation on the saving-investment relationship. Specifically, their perception on the direction of causality between these two variables will be discussed. Understanding the theoretical framework helps interpret the empirical findings of the saving-investment relationship, thereby providing direction on how to enhance saving and investment for the achievement of sustainable growth.

Economic and demographic factors are important determinants of saving behavior (Rehanna 1993). Saving can be promoted by ensuring the security of banking system and improving excess by small savers (World Bank, 1993). By having independence of central bank, increase in financial deepening, increasing the range of financial products and banking reforms would also lead to greater savings (Khan 1993).

The causal relationship between savings and investment has been widely debated in the empirical literature following the pioneering work of Feldstein and Horioka (1980).

III. The Econometric Model

The data for this study have been collected from the National Bank of Ethiopia. The data on savings and investment are collected for the period, 1980-2015.

In order to verify the causality between savings and investment, we follow a two-step procedure as follows: The first step in causality investigation is to verify for the existence of a unit root in the variables. Since many macroeconomic series are non- stationary, unit root tests are useful to determine the order of the variables and, therefore, to provide the time-series properties of data. In order to verify the presence of a unit root in variables, the popular ADF test has been employed. The second step explores the causal relationship between the series. If the series are stationary, then the standard Granger's causality test should be employed. But, if the series are non-stationary and the linear combination of them is stationary, the ECM approach should be adopted. For this reason, testing for co-integration is a necessary pre-requisite to implement the causality test. We have used Johansen's method for verifying the co-integration between savings and investment. The present study utilizes Johansen maximum likelihood procedure for co integration test using maximum Eigen value and Trace statistics.

3 Model specification

Within a Vector Auto Regression (VAR) framework, the concept of Granger causality is deployed to assess whether or not Ethiopia exhibits statistically significant evidence of investment - saving relationship. The concept of Granger causality, by which we actually understand precedence, is based on the idea that a cause cannot come after its effect. More specifically, test for Granger causality are based on the following VAR model:

$$INV_t = a_{11} INV_{t-1} + a_{12} SAV_{t-1} + \varepsilon_{1t} \quad \ldots\ldots 4$$

$$SAV_t = a_{21} SAV_{t-1} + a_{22} INV_{t-1} + \varepsilon_{2t} \quad \ldots\ldots 5$$

A VAR (P) model for four dimensional vector Y_t is given by:

$$y_t = \sigma + A_1 y_{t-1} + \ldots\ldots\ldots\ldots + A_p y_{t-p} + \varepsilon_t$$

Where **Y t** is a vector of non stationary I (1) variables; **X t** is a vector of deterministic variables and $\boldsymbol{\varepsilon_t}$is a vector of Innovations.

$$y_t = \begin{bmatrix} INVt \\ SAVt \end{bmatrix} \quad \begin{bmatrix} a11 & a12 \\ a21 & a22 \end{bmatrix} \quad \begin{bmatrix} INVt-1 \\ SAVt-1 \end{bmatrix} \quad + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix} \qquad \text{……..6}$$

$$y_t = \begin{bmatrix} Int_t \\ savt \end{bmatrix} \qquad \sigma = \begin{bmatrix} \sigma_1 \\ \sigma_2 \end{bmatrix} \qquad \vec{\varepsilon_t} = \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \end{bmatrix}$$

3.1 The study hypotheses

- The 1st Hypothesis: there is no relationship between savings and investment in Ethiopia.
- The 2nd Hypothesis: there is no effect in the Savings and investment in Ethiopia

3.2 Test results for unit roots

The unit-root test helps to identify whether a variable is stationary or not. The test also helps in finding the order of integration at which the variables become stationary. These tests are necessary to avoid spurious correlation between variables. Testing for the presence of unit root in the variables is the primary task before attempting co integration. Stationarity test is performed by Augmented Dickey – Fuller test (ADF test). The null hypothesis tested is that the variable under investigation has a unit root, against the alternative that it does not. In each case the lag-length is chosen by minimizing the Akaike information criteria. The augmented Dickey-Fuller unit root test values of the variables (both at levels and at their first difference) are presented in the following table:

ADF Unit root test Table 1

Variables	ADF Test statistics			
	Level		First Difference	
	Without trend	With Trend	Without trend	With Trend
GDS	-0.796278	-2.941498	-8.41686**	-3.629902*
GCF	3.038025	-1.880004	-7.523799**	-4.339330**
5%critical value	-2.948404	-3.544284	-2.951125*	-3.548490*

Note; *, ** indicate that the variable is significant at 5% and 1% respectively

3.3 Co integration test

ADF test suggests that both I and S are integrated of order one, I (1). This implies the non-stationary of the variables and we cannot use the OLS (ordinary least squares) estimation and apply the usual statistical tests to infer about the relationship between savings and investment. When the variables are non stationary at the level, the relevant method is the use of co

integration as suggested by Johansen. . In this stage, Johansen's co integration test is used to identify co integration relationship among the variables. The Johansen method applies the maximum likelihood procedure to determine the presence of co integrated vectors in non stationary time series.

$$X_t = A_0 + A_1 X_{t-1} + ... + A_P Y_{t-p} + \varepsilon_t$$

The above VAR can be written alternatively

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \varepsilon_t$$

Where $\Pi = \sum_{i=1}^{p} A_i - I$ and $\Gamma_i = -\sum_{j=i+1}^{p} A_j A_j$

$\Pi \mathbf{x}_t$-1 is called the **error-correction term**.

Δ is the difference operator, and I is an k×k identity matrix; Π is the p×p matrix of coefficients, conveys information about the long run relationship between X_t variables and the rank of Π is the number of linearly independent and stationary linear combinations of variables studied. Thus, testing for co integration involves testing for the rank of Π matrix r by examining whether the Eigen values of Π are significantly different from zero

Table 1 results of Johansen's co integration test

Hypothesis			Eigen Value	Maximum Eigen value test		Trace statistical test	
H_0	H_1[a]	H_1[b]		λ_{max}	5% critical value	λ_{trace}	5% critical value
r=0	r=1	r≤1	0.44	20.09*	14.26	20.277*	14.26
r=1	r=2	r≤2	0.005	0.181	3.84	0.181	3.84

* denotes reject the null hypothesis.

Note: a, b denote alternative hypothesis for maximum eigen value and trace statistical tests, respectively. The above table shows that the trace test the null hypothesis of r≤1, r =0 co integrating relation is rejected and the alternative r≤1, r=1 cointgration equation are accepted. This means that there is cointgrating equation. This is confirmed by comparing the trace Eigen

values (λ_{trace}) with the given critical values The Trace test indicates the existence of one co integrating relationship among the both variables at 5 per cent level of significance; and the maximum Eigen value test makes the confirmation of this result. As we prove the existence of long-run equilibrium relationship in the model, the data set is appropriate for further analysis. The test result showed that the null hypothesis (r = 1) can be rejected at 5% level of significance.

3.4 Vector Error Correction Model (VECM) Result

Since there is co-integration, the vector error correction model (VECM) is estimated. The results are presented in table below.

Table:3 the long run regression result for LGDS

Co integrating Eq:	CointEq1
LNGCF(-1)	1.000000
LNGDS(-1)	-0.479753
S.E	(0.02173)
T-value	[-22.0746]
C	-6.488614

R-squared = 0.766041

Adj. R-squared= 0.742645

Akaike information criterion= -1.494415

Schwarz criterion=-1.314843

From equation above, the VECM result shows in equation 1 that there is a significant positive long-run relationship between savings and investment suggesting that an increase in savings impacts positively on investment Ethiopia. Specifically, one unit increase in investment will lead to about -0.48 percent rise gross domestic saving. This is in line with "a priori" expectation implying that increase in savings will boost capital formation in the country which in turn will enhance investment.

LNGCF=+6.489+0.479LNGDS……..1

Table:4 the long run regression result for LGDS

Co integrating Eq:	CointEq1
LNGDS(-1)	1.000000
LNGCF(-1)	-0.478
S.E	0.093
T - value	[-22.2329]
C	13.524

R-squared = 0.225595

Adj. R-squared=0.148154

Akaike information criterion=0.255417

Schwarz criterion=0.193513

Similarly, saving has positive and significant impact on the Ethiopia economy by investment. This suggests that an increase in gross domestic saving will lead to increase in investment in the country; one unit

increase in saving will increase investment by 0.47 percent. This is consistent with theory postulate.

LNGDS=-13.524+0.478LNGCF……..2

3.5. Estimation and Lag selection criteria

An important preliminary step in model building and impulse response analysis is the selection of the VAR lag order. In this thesis we use some commonly used lag-order selection criteria to choose the lad order, such as the likelihood ratio test (LR), the final prediction error (FPE), Akaike information criterion (AIC), Schwarz criterion (SC) and the Hannan-Quinn (HQ) were deployed. Unfortunately, there is disagreement between the criteria and uncertainty about the lag length - some chose one while the others chose two If there is inconsistency between the criterions, it is a good idea to look at the residual correlogram. The correlogram supports a model with two lag length and hence the VAR is order of two and in lag two a strict four lag value of akaike information criteria

Table 5: lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-37.11558	NA	0.036696	2.370641	2.461339	2.401158
1	13.31544	91.69277	0.002203	-0.443360	-0.1712*	-0.351809
2	19.25699	10.0826*	0.00196*	-0.5610*	-0.107543	-0.4084*
3	21.46004	3.471473	0.002210	-0.452124	0.182758	-0.238505

*indicates lag order selected by the criterion

AIC: Akaike information criterion test at 5% level)

HQ: Hannan-Quinn information criterion *FPE: Final prediction error*

SC: Schwarz information criterion *LR: sequential modified LR test statistic (each*

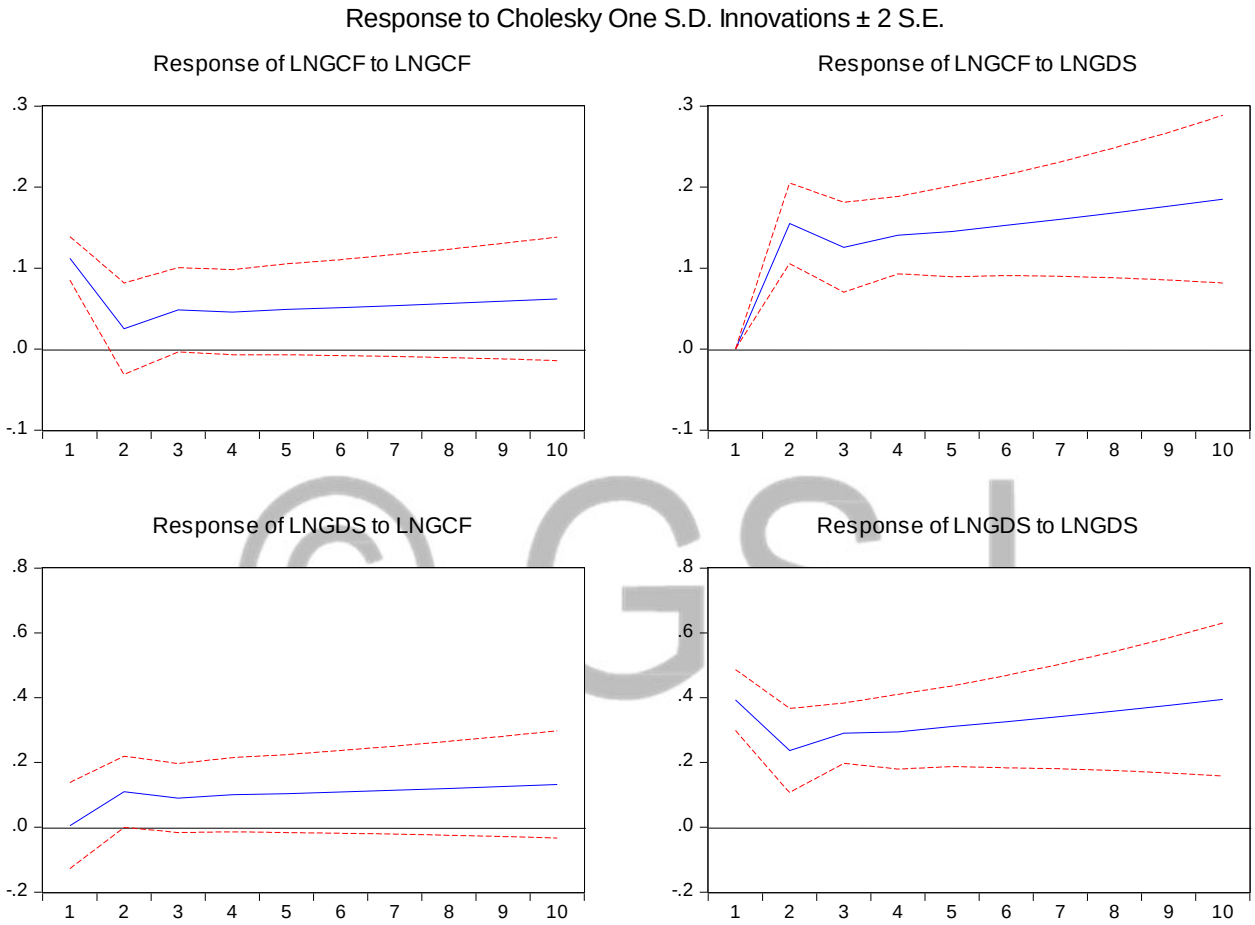
3.6 Impulse response and variance decomposition

Impulse response function (IRF) of a dynamic system is its output when presented with a brief input signal, called an impulse. More generally, an impulse response refers to the reaction of any dynamic system in response to some external change. A VAR was written in vector MA(∞) form as $y_t=\mu+\varepsilon_t+\Psi_1\varepsilon_{t-1}+\Psi_2\varepsilon_{t-2}+\cdots$

The first column expresses the response of each variable to one unit shocks to Investment equation residuals. The first graph shows a highly significant response of Investment to an

impulse in Investment equation residual. On the other hand saving respond at the first lag and the effect disappears immediately. The implication is that an anticipated one unit increase in Investment has impact on the rise to saving. The impact of investment is similar with the saving; the impact significant increasing and remain constant after period two.

Figure 2: Impulse response function



In time series analysis a variance decomposition method is applied in order to help in the interpretation of a VAR model which has been used. The variance decomposition indicates the amount of information each variable contributes to the other variables in the auto regression The results of variance decomposition approach are described on Table 3

Table 6: Variance decomposition

Variance Decomposition of LNGCF:			
Period	S.E.	LNGCF	LNGDS
1	0.172458	100.0000	0.000000
2	0.194060	94.28452	5.715483
3	0.258148	68.88924	31.11076
4	0.307308	60.34649	39.65351
5	0.355972	52.78452	47.21548
6	0.403301	47.95988	52.04012
7	0.446891	44.66993	55.33007
8	0.488844	42.19163	57.80837
9	0.528956	40.35986	59.64014
10	0.567629	38.92775	61.07225
Variance Decomposition of LNGDS			
Period	S.E.	LNGCF	LNGDS
1	0.334613	56.00758	43.99242
2	0.337917	58.50114	41.49886
3	0.382327	58.20461	41.79539
4	0.412788	55.56523	44.43477
5	0.452779	51.41554	48.58446
6	0.494406	48.43822	51.56178
7	0.533954	45.91011	54.08989
8	0.573748	43.74863	56.25137
9	0.612331	42.05306	57.94694
10	0.650107	40.63788	59.36212
Cholesky Ordering: LNGCF LNGDS			

From the results of table 3 we can see that a significant percentage of the variance of gross capital formation (94.28%) is explained by investment innovations in the short run (in a horizon of 2 years). On the contrary, a steady variance (5.71%) of saving by (5.71%) is explained by

innovations of investment in the short run. In a longer horizon of 10 years the percentage of variance of investment is falling deeply at 38.92% implying that other variables influence the 61% of variance of the gross capital formation. On the contrary, the percentage of variance's considerably increased in the case of savings at 61% implying that variations in savings affect investments. A one standard deviation disturbance originating from investment result in percent increase 4.4 in gross domestic saving in the first period. However, this figure decline to about 4.1 percent in the third period but starts rising afterwards. Accordingly, it reaches about 59.3 percent in the 10 th period implying that shock of gross capital formation on gross domestic saving is not dying out.

3.8 Test of heteroskedaticity

Heteroscedasticity is mainly due to the presence of outlier in the data. Outlier in Heteroscedasticity means that the observations that are either small or large with respect to the other observations are present in the sample.

Table 9 Test of heteroskedaticity

Chi-sq	Df	Prob.
37.97399	42	0.6483

3.9 Granger Causality

Granger causality test is a technique for determining whether one time series is useful in forecasting another. It can determine whether there is causality relationship between variables. When two variables are co integrated then Granger causality exists in at least one direction *Bidirectional causality*, is suggested when the sets of *I* and *S* coefficients are statistically and significantly different from zero in both regressions.

Table: 10 Granger Causality

Cause variable	F-test	p-value	Null hypothesis	Decision
Gross domestic saving (DLNGDS)	4.75	0.01 *	Gds does not Granger-cause DLNGCF	Reject the null hypothesis

Gross capital formation (DLNGCF)	11.9	0.002*	DLNGCF does not Granger-cause DLNGDS	Reject the null hypothesis

* indicates significance at 5% level of significance

Long run growth theories imply that saving is positively influenced by investment, meaning that a higher level of investment may lead to higher saving. Results of the present study confirm the coefficient of causality between saving and investment in Ethiopia to be significant ($p< 0.05$), meaning that the causal direction does run from saving to investment in this country.

However, statistically at 1 percent level of significance, there is evidence of a bidirectional causality running from real gross domestic saving to real gross capital formation vice versa. Similarly, savings "Granger" causes investment and therefore changes in savings changes in investment. From this result, we can have that when the cause variable is GDS Gross domestic saving, the p value of the test is 0.01. It is less than 0.05; we can reject the null hypothesis. That mean Gross domestic saving have Granger cause relationship with GCF, when the cause variable is GCF, the p value of the test is 0.002. It is less than 0.05; we can reject the null hypothesis. That's mean GCF have Granger cause Gross domestic saving.

3.10 The Error Correction Models (ECM)

The more suitable approach is to reparametrization VAR into an error correction model (ECM). It is shown that this contains information on both the short-run and long-run properties of the model, with disequilibrium as a process of adjustment to the long-run model (Harris and Sollis, 2003).

Table: 11 error corection

Error Correction:	D(DLNGCF)	D(DLNGDS)
CointEq1	-0.971878	1.244366
S.E	(0.25427)	(0.48315)
T- stastic	[-4.21548]	[2.57552]

After establishing the co-integrating relationship, an error correction models are estimated to determine the short run dynamics. The results of the error correction models are given in Table 11. The speed of adjustment is -97; it indicates that around 97%devation from long run disequilibrium is adjusted nearly one year. The sign of error correction and estimated coefficient is -0.97 and it is statically significant at T static's significant level.

4. CONCLUSION AND RECOMMENDATION

This paper makes an attempt to study the causality between savings and investment in Ethiopia using popular Johansen cointegration methodology. The empirical results suggest that there is long run relation between these variables implying long run co-movement or a tendency of convergence between savings and investment in Ethiopia.

The low saving withholding in Ethiopia is due to non market flows, especially, foreign aid. Saving and investment are coordinated, which suggests that capital mobility is not as high even after the move towards economic integration in Ethiopia.

The direction of causal relationship among the gross domestic savings and gross capital formation using the Granger causality tests based on the VAR framework suggests that the bi direction of Granger causality is from savings to investment or vice versa which is in line with the conventional wisdom. This implies that there is two-way causal relationship between gross domestic savings and gross capital formation.

Regarding the direction of causality between the included variables, a bi-directional causality between gross domestic saving and investment was found to exist, confirming that while an increase in saving may lead to higher investment, additional investment expenditure may also result in a rise in gross domestic saving. This two-way causality between gross domestic savings and gross capital formation not only illustrates the impact of one variable on the other, but it provides policy-makers with several options on how to improve the saving-investment relationship.

Therefore, the government should high lending rate through monetary policy in order to boost so as to bring high sustainable investment equilibrium. Savings should be increased for two main reasons.

Firstly, investment has to be financed some way or the other and therefore savings should be considered. Ensuring an adequate level of gross domestic savings is vital in closing the gap between savings and investment and reducing an extreme dependence on foreign capital which can be a risk due to its volatility. Secondly, it stimulates investment thereby economic growth and this higher growth reinforces savings and investment. Therefore, the government is required to set a sound and fertile environment in order to foster domestic saving that is adequate enough to finance investment and to realize sustainable saving and investment relationship.

To do this, the government should:

- ✓ Create stable and predictable economic atmosphere that honors savers for thrift and decreases the fear that inflation or a collapsing of financial system will lead to confiscation of their savings.
- ✓ Make strong improvement on the fiscal balance, particularly the revenue balance to render public savings positive. Moreover, the government should develop long term savings instruments to mobilize household savings which in turn enhances public savings.
- ✓ Expand microfinance institutions and banks to far flung areas of the country to mobilize domestic savings from the small depositors.
- ✓ Increase the deposit rate of the commercial banks through monetary policy at the disposal of the Central Bank.
- ✓ Government should make policies supportive of increase in domestic saving rather than foreign reliance.
- ✓ macroeconomic stability, a relatively distortion-free relative rice structure, well-defined(and effectively enforced)property rights, an environment conducive to a low cost of doing business, and adequate political institutions that foster social consensus and political stability.

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