

The Long run Relationship between Savings and Investment in Ethiopia: a Cointegration and ECM Approach

G. Ramakrishna

Professor, Dept. of Economics, Osmania University, India.

E.Mail: Profgrk@gmail.com

S.Venkateshwar Rao

Associate Professor, Dept.of Economics, Adama University, Ethiopia

E. Mail: wglsvrao2@yahoo.com

Abstract

The long run relationship between saving and investment has been a serious debate in the empirical literature following the pioneering work of Feldstein and Horioka (1980). Most of these works are cross country studies and do not use long period data. The difficulty with such studies is the homogeneity assumption across the countries. Therefore country specific studies are needed to throw more light on the issue. For Ethiopia, such long period studies are either scant or do not exist. This paper tries to fill this gap and attempts to study the causal link between savings and investment in Ethiopia using cointegration method. The evidence suggests that there is no causation between savings and investment in either direction in Ethiopia. Based on these results some policy measures are recommended.

Key words: Saving, Investment, Cointegration, ECM, causality, Capital mobility and Current account balance.

I. Introduction

Whether saving causes investment or gets caused by investment has been a serious theoretical as well as an empirical debate among the economists. In 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. Contrarily, Keynes argues that an increase in the investment leads to an increase in the output and income which, in turn, will increase savings. Savings and investment are considered to be important variables in achieving price stability and promoting employment opportunities and thereby contributing to economic growth. In spite of the availability of the established theory relating savings, investment and economic growth, there is an ongoing debate as to how precisely savings and investment affect economic performance of a country and vice versa. The debate started with the pioneering work by Feldstein and Horioka (1980). According to them if capital is perfectly mobile, investors care only about the rate of return on their investments and do not worry about in which country they are investing, implying domestic saving need not be equal to domestic investment under perfect international capital mobility. Regressing domestic investment ratio on domestic saving ratio for cross-sectional samples of 16 OECD countries over the period 1960-1974, they found that the estimated regression coefficients, i.e. the "saving-retention coefficients", were all close to one, indicating that most of the incremental saving remain in the country of origin. Miller (1988) opines that if there exists cointegration between savings and investment, the capital is at least somewhat immobile internationally, while the lack of cointegration suggests perfect capital mobility. Therefore, Understanding the causal relationship between savings and investment has become relevant for its policy implications. If the saving causes investment, then promoting domestic savings should be a high priority to boost investment and economic growth. Alternatively, if causality runs from investment to saving, saving-promoting policies are likely to be unsuccessful and may involve economic inefficiencies. Policy emphasis should be shifted away from saving and concentrated in removing the impediments to investment. Most of the existing studies on saving- investment relationships are cross section and cross country studies and do not use long period data. The difficulty with such studies is the homogeneity assumption across the countries, which is unrealistic due to variations in social, economic and institutional conditions. Therefore, country specific studies are needed to throw more light on the causality issue of savings and investment and the related policy issues. 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 rest of the paper is organized as follows: In the next section we present the brief review of empirical works. In section III we present the Ethiopian experience relating savings and investment.

Section IV is on data collection and the empirical model used. Fifth section is on the discussion of the findings. And in the final section, we present the conclusion and policy suggestions.

II. Brief Review of Empirical Works

The causal relationship between savings and investment has been widely debated in the empirical literature following the pioneering work of Feldstein and Horioka (1980). Recently, Sanjib and Joice (2012) explored the relationship between savings and investment in three diverse economies, namely, US, UK and China and compared it with India. They found a cointegrated relationship between savings and investment in these countries. Similarly, Onafowara et al. (2011) studied the relationship between savings and investment in eight advanced economies of the European Union and found statistically significant evidence of cointegration for six countries. Contrary to these findings, Esso and Kebo (2010) have found mixed evidence for the causality between savings and investment for UEMOA countries. The absence of causality between savings and investment has been attributed to capital mobility. For Ethiopia, Gebreyehu (2010) finds no statistically significant causality between savings and investment in either direction. In a wider study on SSA, Cooray and Sinha (2005) report that, out of twenty SSA countries they have studied including Ethiopia, investment and saving are not correlated. Afzal (2007) provides additional evidence on savings and investment relationship in developing countries using conventional and time-series econometrics techniques. He finds no long-run relationship between savings and investment in seven countries of the sample, which implies increased degree of capital mobility and weakening of savings and investment relationship. The results reveal that there is bidirectional causality between savings and investment in South Africa, while there is unidirectional causality from savings to investment in Pakistan and Sri Lanka. And there is no causality in India, Philippines, Malaysia, and Iran. Concluding on this he says the divergence might be due to country-specific policies and economic conditions, and the strong correlation between savings and investment does not rule out capital mobility across these countries. Mishra, et al, (2010) have identified a number of factors that have emerged empirically to explain the savings and investment correlation in both developed and developing countries such as capital mobility, current account targeting, inter-temporal budget constraint and economic liberalization. Cyrille (2010), studying causality for 15 Sub Saharan African countries, concluded that the coefficient of saving and investment relation is low and correlation between inflows and outflows of capital is insignificant, and have no effect on saving- investment relation in these countries. De and Eyden (2005) using stationary panel data for 36 sub Saharan African (SSA) countries including Ethiopia, presented an evidence of high capital mobility. They concluded that the foreign aid and FDI flows determine rate of investment in these countries and not the domestic saving. In most of the studies, the saving retention coefficient was found to be high for developed countries while, the low coefficient for developing countries has been interpreted as high capital mobility in these countries.

III. 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). In this section, an attempt is made to review the experience of Ethiopia relating savings and investment based on the available data (1981-2009) collected from various sources such as World Bank, IMF etc. The data are rearranged to represent the above mentioned sub periods broadly.

The data for the period, 1981-2009 exhibits a wide gap between gross domestic savings (GDS) and gross domestic investment (GDI) in Ethiopia. This gap is large in size and has also widened during this period (World Bank, 2010). In addition, the growth rate of domestic savings is lower than that of investment, and has been declining over time. When we look at the share of gross domestic saving in the GDP, it is about 8.6 % and has come down to 1% in 2008. However, during 1988, Ethiopia has registered an exceptionally high saving rate (17.7 %). The share of gross domestic investment in the GDP for the same period is found to be 18.4%, while the minimum being 10.7 % (1992) and a maximum was 25.5% (2004). The resource gap (measured as the difference between I and S) is about 9.8% during this period and reached a maximum of 22.7% during 2006. Figure 1 reveals that for the entire period, saving rate has been lower than Investment, and both have declined during 1988-1992. These are the penultimate years of Derge regime, during which the civil war in the country

has been intensified. The socialist regime desperately tried everything to contain the war but ultimately had to succumb. However, in the later period, the gross domestic investment has significantly risen.

During the period, 1981 -1991(the last 11 years of the Derge regime) the average saving rate was about 10%, the minimum being 5. 7% (1991) and the maximum was about 17.7% (1988). The average rate of investment was about 15%, the minimum and the maximum were 11% and 23.4% respectively. In this sub period both S and I have become maximum in the same year (1988) and both subsequently declined later. The average resource gap for this sub period was about 5%.

However, the liberalized regime (1992- 2009) presented a remarkable recovery of the rate of investment which increased from 10.7% during 1992 and 25.5% during 2004. The average investment rate for this sub period was 20.4%. The share of investment in the GDP has reached more than 20% after 1997. The relative improvement in the rate of investment in this regime was mainly due to the end of civil war and the policy reforms that have been initiated. However, the share of saving in the GDP in the first 18 years of this regime was not satisfactory when it is compared to the last eleven years of the military regime. This may be due to an increase in the public expenditure and the inflationary situation prevailing in the economy. The average saving rate in the economy was about 7.7%, for most the period savings were below 10%. The deterioration of saving rate in this period has lead to a huge resource gap, which is about 12.7%. The average investment rate for 2005 –2009 has been 22.6%, leading to a resource gap of 20%.

When we compare with the Sub Saharan Africa, the investment rate of Ethiopia was close to the regional average. During 1981 – 2009 the average investment for SSA has been 18.9%, marginally higher than that of Ethiopia. However, the saving rate was smaller than that of SSA average. The low saving rate in the economy indicates much of the domestic investment was financed through the flow external resources such as FDI (foreign direct investment), external debt stocks and ODA (official development assistance).

Table1: Gross domestic saving and investment (as % GDP) in Ethiopia, 1981-2009

Period	Variable	Average	Minimum	Maximum
1981 – 2009	S	8.575	0.438	17.696
	I	18.357	10.714	25.467
	Resource Gap	- 9.782	-3.286	-22.704
1981 – 1991	S	9.980	5.766	17.696
	I	15.041	11.068	23.384
	Resource Gap	- 5.061	-3.286	-6. 273
1992 – 2009	S	7.716	0.438	13.514
	I	20.386	10.714	25.467
	Resource gap	- 12.670	-4.406	-22.704
SSA average (%) 1981 – 2009	S	16.983	13.323	21.402
	I	18.899	15.821	27.230
	Resource gap	- 1.916	0.852	-4.734

Source: World Development Indicators, World Bank, 2010.

Note: SSA= Sub Saharan Africa, S = gross domestic saving (GDS) as % of GDP, I= gross domestic investment (GDI) as % GDP, GDP = gross domestic product, and Resource gap = the difference between S and I.

Table2: Gross Domestic Saving and Investment in Ethiopia

Year	GDS %GDI	Net ODA%GDI	Net FDI%GDI	Total External debt % GDP
1981-1991	65.356	42.020	0.205	57.73
1992-2009	39.834	61.110	9.051	76.254
1981-2009	49.515	53.820	5.700	69.228

Source: World Bank 2010

Table 2 reveals that, the average GDS as percentage of gross domestic investment (GDI) has been declining during 1981 to 2009. For the period 1981 - 1991 it was about 65.36 % but declined to 39.8% of GDI in the years 1992 to 2009. This decline is compensated by an increase in the other sources of investment. For the entire study period, GDS accounts for 49.52% of the GDI, implying that about half the GDI in the entire period was financed through external resource flows.

The FDI flow in to Ethiopia has been insignificant but there is an improvement since 1995. For the entire period FDI accounts for about 5.7 % of the gross investment. The total external debt as a percentage of GDP has been rising since 1981. During the Derge regime, external debt rose from 25% in 1981 to over 71% of the GDP in 1988 and 1990. The average debt stock was about 57.7% of GDP during 1981 – 1991. In the later years there was a tremendous rise in the external debt of Ethiopia reaching a maximum of 146.6 % of GDP in 1994. However, there was a decline in the external during 2006 – 2009 (World Bank, 2010 and National Bank of Ethiopia). The low saving rate in the economy indicates that much of the domestic investment has been financed through the flow external resources such as FDI, external debt stocks and official development assistance (see table 3).

Table 3: Domestic Savings and Foreign Resource Flows in percentage

Year	(GDS/GDI)	(Net ODA/GDI)	(Net FDI/GDI)	(External Debt/GDP)
1981-1991	65.36	42.02	0.21	57.73
1992-2009	30.83	61.11	9.05	76.25
1981-2009	49.52	53.82	5.70	69.23

Source: World Bank, 2010

There are a number of factors that have led to a decline in aggregate savings of Ethiopia; the income, consumption expenditure, interest rate, and inflation in the economy. Table 4 reveals that, the total consumption and gross domestic product grew on the average by 5% and 4.5%, respectively during 1981 – 2009. In the recent period (2003 – 2009), the economy registered high growth rate of 11.20% but the total consumption also grew by 11.4 % during this period. Inflation was around 8.03% and rose to 16.4% during 2003 – 2009. On the other hand, the interest rate on the saving deposits was almost stagnant (5.83%).

Table 4: Growth Rates of GDP, Consumption and Inflation in Ethiopia

Average	1981-2009	2003-2009
Total Consumption	5.0	11.40
Gross Domestic Product	4.5	11.20
Annual Inflation	8.0	16.40

Source: World Bank (2010)

IV. Data and the Econometric Model

The data for this study have been collected from the World Bank Database, 2010, International Financial Statistics and National Bank of Ethiopia. The data on savings, investment and other variables are collected for the period, 1974-2009.

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. However, in the first step, ADF unit root test has been used to verify the degree of integration between variables. If the presence of co integration is confirmed by Johansen test, the vector error correction (VEC) model can be used to show the direction of causality relationship. According to Engle and Granger (1987), the VEC model will be:

$$\Delta Y_t = a_{21}(1) \Delta Y_{t-1} + a_{22}(1) \Delta X_{t-1} + \lambda_y ECT_{t-1} + \varepsilon_{2t} \quad (1)$$

$$\Delta X_t = a_{11}(1) \Delta Y_{t-1} + a_{12}(1) \Delta X_{t-1} + \lambda_x ECT_{t-1} + \varepsilon_{1t} \quad (2)$$

Where, Y_t , X_t and ε are, savings, investment and error term respectively. Also, Δ , (1) and ECT are difference operator, polynomials in the lag operator "L" and the coefficient of the lagged error correction term. Similarly,

λ shows the deviation of the dependent variable from the long run equilibrium. The non-significance of explanatory variable coefficients (a_{11} and a_{22}) is referred to as a short run non-causality. In this case, if no causality in either direction is found, "the neutrality hypothesis" will be supported. We have used the following equation based on Foldestein and Horioka model:

$$I_t = \alpha + \beta S_t + e_t$$

Where,

I = Gross domestic Investment (GDI) as a percentage of gross domestic product (GDP)

S = Gross domestic saving (GDS) as a percentage of gross domestic product (GDP)

e = the white noise error term and t = time

V. Discussion of the Results

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 cointegration. 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:

Table 5: ADF Unit root test

ADF Test statistics		
variables	With constant	with constant and trend
I	-1.287	- 2.616
S	-1.670	-1.789
ΔI	-4.414***	-4.350***
ΔS	-4.213***	-4.251**

Note: ***denotes rejection of the null hypothesis at 1% level and **denotes rejection of the null hypothesis of non stationarity at 5% significance level,

Test for Cointegration

ADF test suggests that both I and S are integrated of order one, I (1) at their levels. 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 cointegration as suggested by Johansen. And to infer the short causality between variables we should use VECM methodology. The implementation of VECM involves the following steps:

1. Deciding the optimal lag length of the of the variables in VAR Test for the number of cointegrating vectors using the trace statistics [λ_{trace}] and maximum Eigen value [λ_{max} statistics]. The λ_{trace} and λ_{max} statistics are used to determine whether the number of cointegrating vectors.
2. In λ_{trace} if $H_0: r = 0$, then $H_1: r > 0$. If the test result rejects the null hypothesis the indication is that there are cointegrating vectors and we proceed by setting $r = 1 \dots 2..$ in the null hypothesis until we fail to reject it. In λ_{max} if $H_0: r = 0$, then $H_1: r = 1$. Rejecting the null hypothesis implies the existence of an exactly one cointegrating vector.
3. If there is cointegration, we run VECM and generate the long run cointegrating parameters which show the long run relation between the variables considered and adjustment coefficients which convey information about the speed of adjustment to long run equilibrium. This is accompanied with VEC diagnostic tests to insure the adequacy of the model.
4. Conduct weak ergogeneity test to identify the dependent and independent variables using the results and construct the long run equation. Then generate error correction term (ECT) from the regression of the long run equation and formulate the Error Correction Model (ECM). Using AIC and SIC criteria, we have decided the optimum lag length of the variables to be 3.

Table 6: Cointegration between Savings and Investment in Ethiopia (1974-2009)

Hypothesis	Lag	λ_{trace} statistic	5% critical value	1% critical value
$H_0:r =0, H_1:r > 0$	1[35]	14.469**	19.96	24.60
	2[34]	5.6779	15.41	20.04
	3[33]	10.1214	15.41	20.04
$H_0:r=0, H_1: r =1$		λ_{Max} statistics		
	1[35]	12.244	15.67	20.20
	2[34]	5.2582	14.07	18.63
	3[33]	9.6164	14.07	18.63

Note: * *denotes no rejection of the null hypothesis at 5% level of significance. Figures in the parentheses are number of observations.

The test result showed that the null hypothesis ($r = 0$) can't be rejected at 5% level of significance. The rank of the vector matrix π , r is zero which means that there is no cointegration vector in the system. The absence of cointegrating vector implies the absence of long run relationship between S and I in Ethiopia.

As per Foldstein and Horioka (1980), the absence of correlation between domestic investment and saving implies high capital mobility. This means there is perfect capital mobility in the Ethiopian economy. Given the rigidities in the financial system, this interpretation seems unrealistic. Ethiopia depends heavily on foreign aid and borrowing to meet its investment requirements. There is less saving retention and the economy depends on external resources to meet the investment requirements. The absence of causality between savings and investment may be due the deficits in the current account. The current account deficits are common in Ethiopia, and this usually balanced by foreign aid and, or borrowing. If these resources are efficiently used it will enhance growth, savings and investment. However, this is not the case with Ethiopia.

VI. Conclusion and Policy Suggestions

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 no long run relation between these variables implying no long run co-movement or a tendency of convergence between savings and investment in Ethiopia. The data analysis also reveals that investment is dependent largely on foreign aid and finance. Ethiopia could not raise its domestic savings to meet the investment requirements and therefore confront the problem of dependence and risk to external shocks. In some of the empirical works (Feldstein and Horioka (1980), the absence of correlation between savings and investment is attributed to the high degree of capital mobility, which is not anyway, the case with Ethiopia. The low saving retention in Ethiopia is due to nonmarket flows, especially, foreign aid.

The non existence of Cointegration between domestic savings and investment in Ethiopia is due the deficit in its current account. of balance of payments The continuous and unsustainable current account deficits which are closely related to the decline in domestic savings particularly in the recent period is the major reason for the absence of long run co- movement between savings and investment. The gap between domestic savings and the investment in Ethiopia will further widen its current account deficits leading to an increase in the foreign debt and debt servicing.

Policy Suggestions

Based on our empirical findings the following suggestions are made:

1. A combined fiscal and monetary policy initiatives are needed to ensure the equilibrium between domestic resources and financing in the economy. Government budget targeting would minimize the resource gap and will bring equality between savings and investment and in the current account.
2. The basic reason for the absence of long run equilibrium between savings and investment in Ethiopia is the decline in savings in the economy. To address this, the pattern of investment should be changed with an objective of promoting employment and reducing inflation. Promoting savings through various incentives such as income tax relief, higher deposit rates should be implemented.
3. The efficient use of external aid and finance to promote growth and savings is the immediate priority.

References

- Afzal, M. (2007).” Savings and Investment in Developing Countries: Granger Causality test,” *Philippine Review of Economics*, 44, No.2.
- Cooray, A. and D. Sinha (2005),” the Feldstein-Horioka Model Re-Visited for African Countries”. UTAS, School OF Economics Discussion Paper 2005-09
- Cyrille, S. M. (2010), “Saving-Investment Correlation and Capital Mobility in Sub-Saharan African Countries: A Reappraisal through Inward and Outward Capital Flows’ Correlation”. *International Journal of Economics and Finance*, 2, No. 2.
- De Wet, A. and Van Eyden (2005), “Capital Mobility in Sub Sub-Saharan Africa: A panel Data Approach”. *South African Journal of Economics*, vol.73; 1-22
- Engle, R.F and C.W.J. Granger (1987), Cointegration and Error Correction: Representation, Estimation and testing, *Econometrica*, 55, pp.251-76.
- Esso, L.J. and Keho (2010),” The savings- Investment Relationship: Cointegration and causality Evidence from Uemoa Countries, *International Journal of Economics and Finance*, pp.174-181.
- Foldstein, M. and C. Horioka (1980), “Domestic Saving and International Capital Flows”. *The Economic Journal*, 90, 314-329.
- Gebreyehu, W. (2010), “Causal Links among Saving, Investment and Growth and Determinants of saving in Sub Saharan Africa: Evidence from Ethiopia,” *Ethiopian Journal of Economics*, 19, no.2.
- International Monetary Fund (Apr, 2010).” *Regional Economic Outlook: Sub-Saharan Africa: Back to High Growth?*” – Washington, D.C.
- Miller, S. (1988),”Are Savings and Investments Cointegrated?,” *Economics Letters*, 27, 31-34.
- Mishra, P.K., J.R. Das and S.K. Mishra.(2010). “The Dynamics of Saving and Investment Relationship in India”, *European Journal of Economics, Finance and Administrative Sciences*, Issue 18, 163-172.
- Mohan, R. (2006), “Causal Relationship between Savings and Economic Growth in Countries with Different Income Levels”. *Economics Bulletin*, 5, No. 3, 1–12
- Onafowara, O. A., Owoye ,O., and Huart ,F. (2011), “The Temporal Relationship between Saving and Investment: Evidence from Advanced EU Countries” *International Journal of business and Social Science*, 2, No. 2.
- Sukar, A and G. Ramakrishna (2002),” The Effect of Trade liberalization on Economic Growth: The Case of Ethiopia,” *Finance India*, 16, N0.4, 1239-1305.
- World Bank (2010), *World Development Indicators*, World Bank CD ROM

This academic article was published by The International Institute for Science, Technology and Education (IISTE). The IISTE is a pioneer in the Open Access Publishing service based in the U.S. and Europe. The aim of the institute is Accelerating Global Knowledge Sharing.

More information about the publisher can be found in the IISTE's homepage:

<http://www.iiste.org>

The IISTE is currently hosting more than 30 peer-reviewed academic journals and collaborating with academic institutions around the world. **Prospective authors of IISTE journals can find the submission instruction on the following page:**

<http://www.iiste.org/Journals/>

The IISTE editorial team promises to review and publish all the qualified submissions in a fast manner. All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Printed version of the journals is also available upon request of readers and authors.

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library, NewJour, Google Scholar

