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Inter-Play Between Saving, Inflation and Economic Growth in Ethiopia: Linkage and Threshold Analysis

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Abstract
The main purpose of this study was to investigate the interplay between savings, inflation and economic growth, and to estimate the threshold level of inflation that is consistent for the economic growth of Ethiopia. 2SLS technique was applied within the framework of Simultaneous equation model using time series data from 1981 to 2015. OLS model was also used for estimating the optimum threshold level of inflation rate for the economic growth. The relationship between domestic saving and economic growth has been found to be one directional and positive; growth causing saving. Foreign aid and final consumption has found positive and significant effect on economic growth. The study has also found significant and positive bi-directional relationship between economic growth and inflation. Inflation has adverse effect on domestic saving and inflation is also negatively affected by Opines to trade. The findings of OLS estimation suggested that 12% threshold level of inflation was consistent for the economic growth of Ethiopia; inflation rates below this threshold level do not have any significant impact on economic growth. These widely deviating findings for Ethiopia requires policy efforts that are relevant for development of a country. In order to achieve high economic growth, policy efforts must be focused on increasing saving, this would eventually induce growth in the economy through widening investment.
Keywords: Economic Growth, Saving, Inflation, Threshold Level, Simultaneous

1. Introduction

The aim of this study was to investigate the inter-relationship between Savings, Inflation and Economic Growth in Ethiopia. These variables are the macroeconomic determinants in which the policy makers and the public concerned with. Saving is considered as very important macroeconomic factor for the improvement of an individual's life as well as a country's economic well being. At nationwide level the achievement of sustainable rapid economic growth along with increasing amount of savings with optimal inflation is the central policy objective of most countries. Hence, the relationship between economic growth, inflation and the savings is an important hot issue. Positive change in saving rate in the long run, accumulated saving, is the source for capital stock which widens investment leading to more employment and output in turn these would boost economic growth(Solow and Swan, 1956).

Hence, like other nations of the world, one of the most fundamental objectives of macroeconomic policies in Ethiopia is the continuation of high economic growth together with optimum inflation, improving saving and promoting investment. Therefore, understanding the existence and nature of relationship between inflation, saving and economic growth is also strategically important for the success of economic policy or how well the policy institutions to adjust functioning atmosphere of the economy. Inflation is monetary phenomena which is the result of an increase in the money supply or velocity of money at a rate greater than the rate of growth in the economy (Friedman, 1948). Therefore, the empirical finding of the effect of a permanent inflation change to economic growth can be positive supporting the Keynesian proposition (Mallik and Chowdhury, 2001), negative with the argument that high inflation rate increase the cost of production and risk of future profitability of investment projects which may force to divert funds to less productive investments evading against inflation; and along with managed exchange rates lead to trade imbalances and speculative capital outflows affecting the economy's growth (Edeme and Ifelunini, 2015, Chaturved et. al., 2008, Paul et al., 1997 and Chopra, 1988) or insignificant supporting the neutrality of money (Chari et al., 1996). When the inflation caused by permanent increase in money has negative effect, it is detrimental on the economic growth while positive effect, an inflation growth would lead to an output growth (Deev and Hodula, 2016). The increasing amount of inflation induces higher economic growth but may cause distorted choice that the policy efforts to contain inflation could negatively affect economic growth. Because higher inflation can lead to conservative investment strategy leading to lower levels of investment in turn lower economic growth, fearing that uncertainty in the future profitability of investment projects. Also the Keynesian model illustrates positive relationship between inflation and growth comprising Aggregate Demand (AD) and Aggregate Supply (AS). According to their model, the interaction between upward slopping Aggregate Supply curve in the short run and change in Aggregate Demand affects both price and output level. This dynamic adjustment in the short run AD and AS exhibits positive relationship between inflation and output growth (Dornbusch et al, 1996).

However, as argued in many literatures saving rate can be affected by macroeconomic uncertainty or inflation. Higher macroeconomic uncertainty (inflation) causes adverse effect on saving or dampens the incentive to save (Khalil A. et al., 2013). Hence, a country with macroeconomic uncertainty (inflation) has low rate of savings which

exerts low capital accumulation and lower investment leading to lower economic growth. On the other hand, monetarists argue that future expectation about inflation reduces people's wealth on the premises rate of return on real money balance falls. Hence, people save money converting to assets until the price of the asset increases, reducing the real interest rate and accumulate desired wealth; thus, increasing capital accumulation causes higher investment inducing higher output growth.

As it is discussed above saving, inflation and Economic growth are interconnected variables and should therefore be endogenously determined simultaneously in the economic performance of a country. However, as to researcher's knowledge most of the studies in Ethiopia focus on the relationship between saving-economic growth and inflation-economic growth but do not consider their linkages simultaneously in their analysis. This gap will be filled by this study by taking a linkage view of savings, inflation and economic growth. This will make it possible to analyze the interactions, links and coordination among these variables. Applying a linkage system strengthens the fact that savings, inflation and economic growth should not be seen and considered independently. They work simultaneously to determine the rate of improvement in the economy of a country. This means, that the policy makers and the government can see importance to stimulate savings and optimize inflation as it exerts improvement in investment and pressure on economic growth.

1.1. Objectives of the Study

1. To investigate the relationship among the savings, Inflation and Economic growth.
2. To determine the threshold level of inflation in Ethiopia.
3. To forward Policy suggestions.

2.0 Review of Empirical Literature

Understanding the linkages and relationship among savings, inflation and economic growth has been a key concern in macroeconomic research. Chaturvedi et. Al., (2009) investigated the inter-relationship between economic growth, savings and inflation for south-east and south Asia in a simultaneous equation framework using 2sls with panel data. They found positive bidirectional relationship between saving and economic growth but inflation has significantly negative effect on economic growth and positive effect on saving rate. They also found that economic growth has insignificant effect on inflation in the analyzed countries. Ilyas et al., (2014) investigated inter relationship among economic growth, saving and inflation and also estimated threshold level of inflation for Pakistan for the period of 1973-2010. Using 2sls estimation method they found that economic growth is negatively affected by inflation and real interest rate where as positively affected by depreciation rate. Economic growth, unemployment and real interest rate were negatively affecting the inflation rate, while indirect taxes had positive impact on inflation. They also found that economic growth, dependency ratio and foreign direct investment were beneficial for enhancing the savings of a country, while depreciation rate is harmful for savings. By applying OLS they indicated that 9% was the threshold level of inflation consistent with Pakistan growth. Rao and Abate (2015) analyzed inflation and economic growth VAR and VECM and threshold level of inflation using time series data for the period of 1974-2012. They found negative bidirectional causal relationship in long run as well as short run. They also suggested 9 to 10 percent threshold inflation level as optimal for economic growth of Ethiopia. Khan And Senhadji (2001) examined the threshold effects on the relationship between inflation and economic growth, distinguishing industrialized and developing nations, by using the econometric techniques and the panel data for 140 countries covering the period from the year 1960 to 1998. Their results suggest the threshold level of 1% to 3% for industrialized nations and 7% to 11% for developing nations. Inflation below the threshold limit has no adverse effect on economic growth and above which slow down economic growth significantly. In the simultaneous equation framework using 2sls method Richardson Kojo Edeme and Innocent Ifelunini (2015) examined the linkage among economic growth, saving and inflation in the economic performance of Nigeria using annual time series data from 1980-2013. The study found that inflation and interest rate were harmful to economic growth while exchange rate was beneficial. Also the study indicated that inflation rate was negatively affected by economic growth, unemployment and real interest rate, while positively affected by indirect taxes. The result further shows that economic growth; exchange rate and foreign direct investment engender savings while depreciation rate endangers savings. They suggested threshold level of 8% was found to be consistent with Nigeria growth; beyond this level inflation endanger growth of the country. Patra et al., (2015) examined the saving, growth and inflation nexus in Asia through panel data approach for the period 1981 to 2011. Their result revealed unidirectional significant positive relationship between saving and economic growth running from saving to economic growth. Trade openness and population growth are found to be adversely affected economic growth. They also found that economic growth negatively and significantly affected inflation but inflation positively and significantly affected saving. It is also found that saving rate was positively affected by interest rate, inflation and literacy rate while negatively by dependency ratio. Money supply has been found negative effect on inflation while growth rate and real interest rate are found to be positively affected inflation. Beshir (2016) analyzed domestic saving in fostering economic growth in Ethiopia using VECM approach. The estimated result indicated

that saving is positively affected by GDP growth in long run as well as in short run and terms of trade while negatively affected by inflation. Hailu and Abay (2015) investigated the effect of inflation on gross domestic saving using time series data of 1975-2014. Their result suggested inverse relationship between saving and inflation in short run while real GDP has been found positive effect on domestic saving their result also indicated insignificant effect of real interest rate on saving. Shimelis (2014) examined the causal relationship between saving, investment and economic growth in Ethiopia using annual time series data from 1970-2011 in a multivariate framework using ARDL approach. The result indicated that economic growth was positively affected by labor and investment in the long run as well as short run but domestic saving and human capital was insignificant. But it was found that economic growth has been found to positively affect domestic saving. The result suggesting unidirectional causal relationship running from economic growth to saving while bidirectional causal relationship between economic growth and investment and investment and domestic saving.

Based on the literature reviewed above, different studies conducted at different geographical area with different choice of variables and models revealed inconsistent and inconclusive results. The interrelationship among savings, inflation and economic growth has remained uncertain and undetermined in Ethiopia since; no study has been undertaken on the linkages among these variables. This has been identified as the existing gap of knowledge in literature.

3.0 Methodology and Data Source

3.1 Data Source

Annual time series data were used from 1981 to 2014. The data were taken from National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MOFED), World development indicator (WDI) and International Financial Statistics (IFS).

3.2 Methodology

This study employed the simultaneous equations system model. Three equations were used in the study to complete the model. When there is bidirectional causation in the variables included in the model then the given model cannot be handle as a single equation model, but it needs multiple equations model called simultaneous equation model to investigate the relationship among the variables mutually dependant in the model. Hence, unlike single equation model the simultaneous equation model analyzes simultaneous relationship between two or more endogenous variables. In this system the endogenous variables of one equation may appear as predetermined variables in the other equation of the system. In this situation the classical OLS method may not be applied because an endogenous explanatory variable becomes stochastic and correlated with the disturbance term of the equation in which it appears as an explanatory variable thus the estimates obtained are inconsistent, biased and does not converge to their true population value (Gujaratt, 2004). In this simultaneous equation model the researcher has expected to check whether the model satisfies the order and rank condition (identifiability of the model) or not. That means the model is whether under identified, just identified or over indentified. The identifiability of an equation depends on whether it excludes one or more variables that are included in other equations in the model. If the model is under-identified then it cannot be estimated by any method. When the model is fully identified Indirect least square (ILS) method is used and when model or equation is over identified then two stages least square (2SLS) technique is used to estimate structural parameters of the model. This paper developed the simultaneous equation and model structural form as follows:

MODEL 1: Simultaneous equations Model

$GDP_t = f(DS_t, CPI_t, EXR_t, OT_t, INV_t, CONS_t, AID_t)$ ……..(1)

$DS_t = f(GDP_t, CPI_t, INV_t, EXR_t, DR_t)$ ……..(2)

$CPI_t = f(GDP_t, DSt, FD_t, OT_t)$ ……..(3)

In equation form (1) - (3) can be written as:

$lnRGDPt = \alpha_1 lnDSt + \alpha_2 lnCPIt + \alpha_3 lnEXRt + \alpha_4 lnOTt + \alpha_5 lnINVt + \alpha_6 lnCONS + \alpha_7 lnAIDt$.....(4)

$lnDSt = \beta_1 lnRGDPt + \beta_2 lnCPIt + \beta_3 lnAIDt + \beta_4 lnEXR + \beta_5 lnDRt$……..(5)

$lnCPIt = \Theta_1 lnRGDPt + \Theta_2 lnDSt + \Theta_3 FD + \Theta_4 lnOTt$……..(6)

Where $\alpha 1$-$\alpha 6$, $\beta 1$-$\beta 5$ and $\Theta 1$- $\Theta 4$ are structural parameters, RGDP= Real Domestic Product (proxy for economic growth), DS= Domestic Saving, CPI= Consumer Price Index (proxy for Inflation), EXR= Exchange Rate, OT= Openness to Trade, INV = Investment, CONS = Sum of Final government and private consumption, DR = Age Dependency Ratio, FD = Fiscal Deficit,

ln = Natural logarithm, t= time .

Based on the identifiability condition, the researcher checked that the above equations were over identified. Therefore, Two-stage least square (2SLS) method is used to investigate the relationship among the above variables which gives consistent and efficient estimators in over identified simultaneous equation model.

MODEL 2: Threshold Level Analysis Model of inflation and Economic growth

Another detailed analysis of this study is the estimation of threshold level of inflation consistent with Ethiopia's

economic growth. It examines the point of inflexion or non-linear relationship between the inflation rate and economic growth. Using threshold level analysis model, recently many researchers examined the point of inflexion for developing as well as developed countries. Khan and Senhadji (2001) for industrial and developing countries, Ilyas et al., (2014) for Pakistan and Edeme (2015) for Nigeria estimated threshold level using the same model. This paper also adopted the same model for the estimation of the threshold level of inflation for the case of Ethiopia as follows:

$lnGDPt = \psi_0 + \psi_1 IFRt + \psi_2 D(IFRt-K) + \varepsilon t$ .....(7)

In the above model, the variables are defined and computed as follows:

*lnGDP*t = economic growth, *IFRt* = annual inflation rate, D is the dummy variable defined as: $D = 1$ *if* $IFr > K$; *and* $D = 0$ *if* $IFR \leq K$. Where, *K* represents the threshold level of the inflation at which structural break occurs and ε is disturbance term.

The threshold level of inflation is determined at that point where the value of R^2 is maximum, which is the adequate level of threshold that minimizes the residual sum of square (RSS). To this end, Ordinary Least Square (OLS) estimation technique was employed.

4. Result and Discussion

This section presents two separate empirical estimation results. The first empirical estimation presents the relationship between saving, inflation and economic growth which is estimated by using the simultaneous equations model by applying two-stage least square method. The second empirical analysis presents the threshold level of inflation for the economy of Ethiopia which is estimated through Ordinary Least Square Estimation method. The empirical results and their brief discussion are given below.

The regression result in the table 1 below indicates that there is insignificant positive relationship between domestic savings and economic growth of Ethiopia. This indicates that the domestic saving is not sufficiently contributing to achieve the required level of country's economic growth. The regression result also revealed that inflation is significant to bring positive change in the economic growth. This result suggests that inflation promote economic growth through encouraging productivity and output level. The existence of positive effect of inflation on real GDP growth can be justified through two dimensions. The first one is that, it may be inducing growth by lowering the propensities to save of households and redistributing profits to firms by increasing propensities to save and invest, and by increasing the nominal rates of return relative to the cost; and the second one is, it is redistributing money from holders of money balance to the monetary authorities, known as inflation tax that helps government to expand investment programs and thereby increasing growth. The coefficient value of inflation which is 1.771 indicates that 1 percent increase in the prices, on average; brings 1.771 percent goes up on economic growth. Investment has statistically insignificant effect on growth but with unexpected sign. The regression result also indicates that exchange rate statistically insignificant negative effect on economic growth. This indicates that exchange rate does not matter for the growth of Ethiopia consistent with the empirical conclusion of (Habib et al., 2016) that exchange rate does not matter for the growth of developing countries. The trade opines has positive but insignificant effect on growth. This positive sign indicating that international trade is important in enhancing productivity growth through injection of new production technologies through positive effect on the efficiency in production (Dollar and Collier, 2001). From the table 1 above, the regression result revealed that consumption has positive and significant effect on economic growth. This finding shows that final consumption expenditure turns to be productive and accelerates economic activities in Ethiopia. This finding supported the Keynesian consumption theory, that consumption is an exogenous factor and a policy instrument for increasing economic growth. The regression result also revealed that foreign aid has positive and significant impact on economic growth of Ethiopia. The positive effect of aid on growth justifies that foreign aid is serving as a means of breaking the bottlenecks (lower saving and investment) that face in the country, by allowing fuller utilization of all resources and sustaining longer-term growth in an economy.

Table 1. Structural Form Parameter Estimates of economic growth

Variables	coefficients	Std error	t-statistic	P- value
Const	**-0.576**	**1.725**	**-0.33**	**0.739**
lsDS	**0.361**	**0.363**	**0.99**	**0.323**
lnCPI	**1.771**	**0.866**	**2.05**	**0.044**
lnINV	**-0.800**	**0.776**	**-1.03**	**0.306**
lnEXR	**-0.150**	**0.271**	**-0.55**	**0.581**
lnOT	**0.562**	**0.559**	**1.01**	**0.317**
lnCONSN	**0.781**	**0.341**	**2.29**	**0.024**
lnAID	**0.154**	**0.065**	**2.35**	**0.021**

R^2= 0.7942

The regression result in the table 2 below indicate that economic growth has highly significant positive impact of on domestic savings, consistent with the finding of (Shimelis, 2014, Chaturvedi et al., 2009, Hailu and Abay, 2015and Beshir, 2016) in the literature. This finding supports the standard Keynesian proposition which says that savings of a country depends on the level of economic growth. Thus along with higher income, at higher growth rate of economy, the saving rate is higher. Based on this result when economic growth of the country increases by 1 percent the earning of the people will also be increased and ultimately domestic savings will increase by 2.565 percent every year. Higher growth leads to higher saving. The other finding in this study is that there is statistically significant inverse relationship between inflation and domestic savings consistent with finding of (Hailu and Abay, 2015). This indicates that increase in uncertainty of price or higher inflation induces people to save smaller portion of their money and direct larger portion of their money to consumption. The effect of dependency ratio on domestic saving is statistically insignificant consistent to the finding of (Chaturvedi et al., 2009) in the literature.

Table 2. Structural Form Parameter Estimates of Domestic saving

Variables	coefficients	Std error	t-statistic	P- value
Const	**-10.635**	**13.510**	**-0.79**	**0.433**
lnRGDP	**2.565**	**0.782**	**3.28**	**0.002**
lnCPI	**-2.700**	**1.082**	**-2.49**	**0.015**
lnAID	**-0.437**	**0.274**	**-1.60**	**0.114**
lnEXR	**-0.071**	**0.273**	**-0.26**	**0.795**
lnDR	**2.948**	**7.525**	**0.39**	**0.696**

R^2 = 0.8144

In Table 3 below, the result shows that economic growth has positive and significant effect on inflation. The coefficient value of economic growth 0.509 indicates that a 1 percentage increase in economic growth led to 0.509 percentage rise in the inflation. This finding supports the argument of famous Philip's curve and output gap that demonstrates the existence of a positive relationship between inflation and economic growth that is ascertained due to the difference between actual and potential output. The underlying reasoning for this positive relationship can be shown through the channel of aggregate demand and aggregate supply. When the level of actual output is greater than potential output, this will generate an upward rise on wages in the labor market. The higher labor wages induces higher production costs and hence higher prices. The aggregate demand for output stimulates economic agents to produce more output in the economy and increases aggregate supply and simultaneous rise in price level. The result also revealed that domestic savings has no significant effect on inflation. The regressed result of inflation on openness to trade revealed that openness to trade has negative and significant impact on price level. Openness to trade association with falling prices is important to favor international trade and higher economic benefit of country from the rest of the world. This inverse relationship between trade openness and inflation suggests that trade openness reduces inflation through its positive impact on output, especially improvements in agricultural productivity, mainly through increasing efficiency of production, better allocation of resources and technology transfer, improving capacity utilization, and increasing foreign investment.

Table 3. Structural Form Parameter Estimates of inflation

Variables	coefficients	Std error	t-statistic	P- value
Const	-1.990	0.223	-8.93	0.000
lsRGDP	0.509	0.041	12.33	0.000
lnDS	-0.013	0.039	-0.33	0.743
FD	0.001	0.025	0.05	0.962
lnOT	-0.238	0.531	-4.25	0.000

$R^2 = 0.9921$

The estimation result of the threshold level by applying ordinary least square (OLS) method is reported in the table 4 below which shows values of the threshold level of inflation. To determine the optimum level of inflation consistent with economic growth, R-square and residual sum of square (RSS) were taken into account. The optimum level of inflation that is consistent with economic growth is determined taking as criteria a point where the value of R-square maximum whereas the value of residual sum of square reached minimum point. Based on these criteria the estimated OLS regression result shows that 12% inflation rate is threshold level consistent with economic growth of Ethiopia. At this threshold level inflation is significant to affect economic growth. Below this threshold level inflation is not significant to stimulate economic growth in the country.

Table 4. Threshold level of inflation consistent with economic growth.

K	Variables	Coefficients	Std. Error	T- stattistics	R^2	RSS
5	Const INF Dummy	10.44 0.025 0.249	0.387 0.313 0.658	26.99 0.81 0.38	0.058	79.64
6	Const INF Dummy	10.43 0.022 0.32	0.362 0.032 0.660	28.82 0.69 0.50	0.0607	79.42
7	Const INF Dummy	10.45 0.0199 0.377	0.343 0.333 0.668	30.44 0.60 0.56	0.062	79.28
8	Const INF Dummy	10.53 0.038 -0.101	0.321 0.036 0.715	32.81 1.05 -0.14	0.055	79.90
9	Const INF Dummy	10.58 0.0688 -0.896	0.312 0.036 0.720	33.97 1.91 -1.24	0.0915	76.81
10	Const INF Dummy	10.55 0.0599 -0.670	0.312 0.0367 0.741	33.78 1.63 -0.91	0.0745	78.25
11	Const INF Dummy	10.51 0.070 -0.966	0.308 0.0362 0.760	34.11 1.93 -1.27	0.0931	76.685
12	Const INF Dummy	10.52 0.075 -1.06	0.306 0.0366 0.756	34.34 2.04 -1.40	0.101	76.015
13	Const INF Dummy	10.52 0.039 -0.165	0.315 0.037 0.793	33.35 1.07 -0.21	0.0557	79.85
14	Const INF Dummy	10.46 0.067 -0.948	0.313 0.036 0.814	33.36 1.85 -1.17	0.0872	77.18

5. CONCLUSSION AND POLICY SUGGESTION

This paper investigated the relationship between saving, inflation and economic growth using the Simultaneous equation model for Ethiopia using annual time series data for the period of 1981-2015. OLS model was also used to estimate threshold level of inflation rate consistent for the growth. The results of 2SLS model shows that there exist bi-directional causality between inflation and economic growth and the results also revealed that they positively affect each other. Foreign aid and final consumption have been found significantly positive effect on

economic growth. It has been also found that economic growth have positive relation with domestic saving whereas inflation has been found negatively related with domestic saving. It has been also found that opines to trade has negative impact on inflation. Unidirectional causality found from economic growth to domestic savings. Threshold level of inflation consistent for the economic growth was also investigated by using OLS estimation method. The rate of inflation was taken from 3% to 15%. The estimation result revealed that 12% of inflation rate is significant to positively affect economic growth of Ethiopia. This finding shows that 12% of inflation rate is beneficial for the economic growth of Ethiopia.

From the view of developmental policy, the finding of a unidirectional causal relationship between savings and economic growth, running from economic growth to saving suggests that, in order to achieve high economic growth, policies efforts must be focused on increasing saving, so that, increase in savings would eventually induce growth in the economy through widening investment.

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