Inflation and Economic Growth: Inflation Threshold Level Analysis for Ethiopia

Dr.P.Nandeeswara Rao
Ass.Professor,
Hawasaa University,Ethiopia.
pnraao@gmail.com

Abate Yesigat
Head, Department of Economics
Hawasaa University, Ethiopia
abateyesigat@yahoo.com

Abstract: **One of the main objectives of macroeconomic policy of the Ethiopian economy is to attain sustainable economic growth together with stable price level. However, in recent times the country has been experiencing an increase in price level and the situation has got wide range of concern regarding its effect on economic growth. Hence, the central focus of this research is to look into the nature of inflation-economic growth relationship of Ethiopia from 1974 to 2012, specifically by using the framework of Vector Auto Regressive (VAR), Error Correction Mechanism(ECM), causality test and threshold level analysis using annual data covering the period from 1974 to 2012. All the variables are tested for unit roots using Augmented Dickey Filler (ADF) test and the test results revealed the variables are stationary at their first difference. The results of co integration test, using Johansen Maximum likelihood approach, indicate the existence of long run relationship among the variables entered in the models. The Granger Causality Test found the bidirectional causal relationship between inflation and economic growth. And the result also reveals the negative relationship between inflation and economic growth in Ethiopia both in the short and long run. The threshold model estimation recommends 9-10 percent threshold inflation level, which is optimal for economic growth. Above this level inflation affects economic growth negatively. Therefore, controlling moderate inflation should be the main goal for policymakers in Ethiopia. Finally, though the research achieved the objectives mentioned, lack of quarterly data on many important macroeconomic variables act as a limitation of the study.**

Keywords: **Economic Growth, Inflation Vector Auto Regressive, Threshold level in Ethiopia**

INTRODUCTION

The aim of any country is to achieve rapid and sustainable economic growth. Meanwhile, for this type of growth to occur, there is the need to have stable macroeconomic environment. However, achieving macroeconomic stability, such as, low rate of inflation, manageable trade and balance of payments deficits, higher saving and investment rate to finance long run economic growth is challenging in developing countries. This problem has become even more complex in today's world of globalization where developing countries are prone to further underdevelopment if the necessary policy-mix is not prudently formulated and carefully implemented (Ahortor, 2009).

Hence, one of the most pressing issues, which affect macroeconomic stability in most of the developing countries, is inflation. Worldwide inflation is recently rising, due to higher energy and food price, rapidly rising demand in emerging economies, poor harvest in commodity producing countries, and diversion of food crops to production of biofuels. For instance, in August 2009 World, Emerging and Developing, and Sub Saharan Africa -inflations were 2.3%, 5.5% & 9.5%, but in August 2011 it increased to 4.9%, 7.6% and 11% respectively (IMF, 2011).

The concern about inflation emanates not only from the need to macroeconomic stability, but also from the fact that inflation hits the society of a given economy specially the poor, inject noise into the price system, makes long term financial planning more complex, undermined public confidence in the economy and in the management of economic policy generally (Ahortor, 2009). In addition to this, high inflation results in decline in private investment (both domestic and foreign investors lose confidence and become reluctant to invest in the economy), rise the relative price of domestically produced products and hence reduce the country's international competitiveness and leads to balance of payments problem, reduce real income of the people, reduce saving and in turn result in low investment (Isakova, 2007).

Historically, the Ethiopian economy was known for its low inflation. Prior to 2003/04, the country has not suffered from high inflation. Since 2004, however, the economy has deviated from its historical trends of stable price and inflation rose from 3.3 percent in 2004/05 to as high as 44.39 percent in 2008/09 (NBE, 2010). Similarly, over the long period of time the Ethiopian economy was known by its slow growth rate and highly dominated by the agricultural sector, which contributes more than 50 percent of the GDP. However, for the last few years, Ethiopian economy has shown continuous and high growth rate. For instance, between 2004/05 and 2009/10 real GDP grew by more than 11 % on average (MoFED, 2010).

Statement of the Problem

Globalization, privatization and liberalization policies of the world have made to become a global village all the world countries. Since every country has to face heavy competition, go far information technology, faster communication and

faster delivery of goods and services has become mandatory for all the countries. In this scenario the countries in the world are thinking to stabilize their economy. As a part of this for sustainable development Ethiopia is thinking in a positive way to stabilize its economy since it's a developing country. Keeping in mind this objective majorly.

One of the fundamental objectives of macroeconomic policies in both the developed and developing economies is to sustain high economic growth together with low inflation. Likewise, one of the most fundamental objectives of macroeconomic policies in Ethiopia is to sustain high economic growth together with low, single-digit inflation as stated in the five-year Growth and transformation plan so as to maintain macroeconomic stability and to boost saving and investment (MoFED, 2010).

The existence of high inflation under double-digit economic growth seems contradictory situation and puzzling for the policy makers and for the societies at large. Moreover, the increasing price has also become detrimental to the low-income groups and retirees who live with a fixed income. This situation has got wide range of debate regarding the relationship between inflation and economic growth among different stockholders. They also argued that the upsurge in inflation might adversely affect economic growth that the country has experienced recently. As a result, various direct and indirect monetary and fiscal policy measures were taken (like increases the reserve requirement, increasing the deposit rate, instituted credit restrictions and others fiscal policy measures). However, these policy responses were carried out without a detailed research on the optimal level of inflation.

Furthermore, both theory and empirical evidence indicate that there is no straightforward and one-sided relationship between inflation and economic growth. Theoretically, the phenomenon of inflation and economic growth relationship has been discussed ever since the appearance of classical economic theory and been furthered later on as the development of modern economic theories. Keeping in view after 1930's great depression, in 1936, the high government involvement was suggested to adjust the market failure. The higher government spending in various activities stimulates higher consumption or investment spending which attracts higher price for goods and services in the economy. The higher desire for spending encourages producer to produce goods and services that demanded by the consumers. Such situation enables the country to achieve economic growth with higher inflation.. This situation challenged the effectiveness of higher government spending in stabilizing the economy. At this time, the neo-liberal argument dominated the world. In their argument, neo-liberal believes that inflation and economic growth have negative relationships. The higher inflation reduces investment and foreign reserve that lead to lower economic growth. But the latest study conducted by a number of researchers produced different outcomes regarding the relationship between inflation and economic growth.

The results of previous empirical literature both in the context of developed and developing countries have also supported the complexity of this issue. Put differently, different empirical studies both in developed and developing countries has also showed different results such as; no-relationship (Datta and Kumar, 2011), negative relationship (Barro, 1995; Ahmed and Mortaza, 2005) and positive relationship (Mallik and Chowdhury, 2001) between inflation and economic growth. Despite the considerable disagreement in the literature, a recently emerging research agreed on some aspect of their relationship. Specifically, the non-linear relationship is becoming obvious. However, the level of inflation which is growth discouraging is inconclusive and depends on country specific characteristics.

Therefore, the question is; how low should inflation be? Or put in different words; is there a level of inflation at which the relationship between inflation and economic growth becomes positive? The hypothesis is that; at some low rate of inflation, the relationship between the two variables is non-existent, or perhaps even positive, but at higher rates it becomes negative. As Khan (2001) puts it, if a relationship between inflation and economic growth exists, then it should be possible in principle to estimate the inflexion point, or threshold. In an effort to establish the impact of inflation on growth and provide an estimate of the inflation level that can support the growth process, this paper intends to estimate an optimal inflation level that is consistent with a high growth performance. We will analyze the non-linear interaction between inflation and growth using a non-linear least squares approach, which allows estimating the threshold level of inflation and formally testing its significance. To alleviate the problem of endogenity, VAR method of analysis will be employed. After confirming the robustness of the estimation result using alternative approaches, the economy could benefit if the monetary authority target inflation around this threshold level. Thus, the questions that this paper seeks to answer include the following.

- ➢ What is optimal (threshold) inflation level that is consistent with high economic growth performance in Ethiopia?
- ➢ What is the causality between inflation and economic growth in Ethiopia? Uni-directional or bi-direction?
- ➢ What is the effect of inflation on economic growth of Ethiopia?

Objectives of the study
The general objective of the study is to estimate an (threshold) optimal inflation level that is consistent with a high economic growth performance.

Specific Objectives:
- ➢ To investigate empirically the direction of relationship between inflation and economic growth
- ➢ To empirically examine the short-run and long run effects of inflation on economic growth of Ethiopia.
- ➢ To give possible policy recommendations based on the finding.

METHODOLOGY

Theoretical framework and model specification

The phenomenon of inflation and its effect on real economic variables has been discussed ever since the appearance of classical economic theory and been developed later on as the development of modern economic theories. In this section, there will be a review of different economic theories, and the focus in this case is on the explanations of inflation and its effect on economic growth.

Classical growth theory: Adam Smith who pointed a supply side driven model of growth laid the Classical growth model. He viewed saving as a creator of investment and hence growth. Therefore, he saw income distribution as being one of the most important determinants of how fast (or slow) a nation would grow. He also posited that profits decline – not because of decreasing marginal productivity, but rather because the competition of capitalists for workers will bid wages up. The link between the change in price levels (inflation) and its effects on profit levels and output were not specifically articulated in classical growth theories. However, the relationship between the two variables is implicitly suggested to be negative, as the reduction in firms' profit levels through higher wage costs. Put simply, according to classical explanation inflation affects economic growth negatively (Gokal and Hanif, 2004).

Keynesian growth theory: In the framework of Keynesianism, the aggregate demand (AD) and aggregate supply (AS) curves are adopted to show the relationship between output and inflation. According to Keynesian, in the short run, the AS curve is upward sloping rather than vertical. If the *AS* curve is vertical, changes on the demand side of the economy affect only prices. However, if it is upward sloping, changes in *AD* affect both price and output. This holds with the fact that many factors, such as expectations, prices of other factors of production, fiscal and monetary policy, drive the inflation rate and the level of output in the short-run. When the general prices increase Producers of a certain product feel that only the prices of their products have increased while the other producers are operating at the same price level. However, in reality overall prices have risen. Thus, the producer continues to produce more and output continues to rise. It reveals that according to Keynesian there exists a positive effect of price increase on output at least in the short-run (Snow don, 2005).

Monetarist growth theory: Monetarists linked inflation and economic growth by simply using the quantity theory of money, by equating the total amount of spending to the total amount of money in the economy. This can be shown as below by taking Velocity of money constant in the short run:

$$\frac{\Delta Y}{Y} = \frac{\Delta M}{M} - \frac{\Delta P}{P} \quad (1)$$

Where: $\frac{\Delta Y}{Y}$ -the growth rate of output, $\frac{\Delta M}{M}$ -the growth rate of money supply and $\frac{\Delta P}{P}$ inflation. The above equation indicates unambiguously negative relationship between inflation and economic growth (Dornbusch and Fischer, 2001).

Neo-classical and endogenous growth theories: Mundell (1963) and Tobin (1965) have explained the effect of inflation on economic growth based on neo-classical growth theory. They depict a positive relationship between inflation and economic growth by assuming that real money balance and investment are substitute. Thus when inflation is high, it will decrease the return on real money balances but the return on investment will increase and people substitute real money balance by investing on other assets. This increases capital accumulation and the economic growth and it will show positive relationship between inflation and economic growth.

Contrary to the conclusion of the Mundell-Tobin effect, Stockman (1981) develops a long-run equilibrium growth model with assumption of "cash-in-advance constraint. In the model of Stockman (1981), the two variables relationship is complement, accounting for a negative relationship between the steady-state level of output and the inflation rate. Stockman models this cash investment as a cash-in-advance restriction on both consumption and capital purchases. Since inflation erodes the purchasing power of money balances, people reduce their purchases of both cash goods and capital when the inflation rate rises. Correspondingly, the steady-state level of output falls in response to an increase in the inflation rate. Also return to labor falls when the inflation rate rises. As such, people substitute away from consumption to leisure, because the return on labor falls and this in turn reduce economic growth.

Thus, this study has used the combination of the above theory so as to develop the theoretical framework that helps to examine the effect of inflation on economic growth. According to the endogenous growth model, which is the extended form of the neo-classical growth model, production function is given as:

$$Y = F(K, L, H) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

Where, $Y, K, L \& H$ are levels of output, physical capital, labour force and human capital respectively and these variables are known as supply-driven inputs (Dornbusch and Fischer, 2001,Romer,1996). Monetarists' link inflation with economic growth using the quantity theory of money as can be seen from equation (1) above. Economic growth in addition to supply driven factors depends on demand side variables. Thus, a theoretical framework, which helps to examine the effect of inflation on economic growth, can be specified as follow by including both supply and demand variables.

$$RGDP_t = \beta_0 + \beta_1 PK_t + \beta_2 LF_t + \beta_3 HCD_t + \beta_4 CPI_t + \beta_5 M2_t + \beta_6 OPP_t + \beta_7 REER_t + \beta_8 DD_t + \mu_t \dots(3)$$

Where $RGDP_t$ refers to real gross domestic product, PK_t to physical capital, LF_t to labor force, HCD_t to human

capital development, CPI to consumer price index, $M2$ to broad money supply, OPP_t to openness, REER to real effective exchange rate, DD, is dummy to drought μ_t to denotes the stochastic error term and subscript t refers to time. All variables are in log form.

Data type and source

The study use annual time series secondary data covering the period from 1974/75 to 2011/12 and collected from different sources. The potential caveats that hinder the success of this study include lack of adequate data, data aggregation, time and financial constraints and the like. The absence of quarterly data on some macroeconomic variables like real GDP and government spending in Ethiopia has forced the present study to rely on annual. The major data sources for the problem under investigation are shown in table 1 below.

Table 1: Sources of data and measurement

| Variable description	Unit	Source
Consumer Price Index (CPI)	Index number	NBE
Real effective exchange rate (REER)	Index number	NBE
Real Gross Domestic Product (RGDP)	In million birr	MoFED
M2-broad money supply	In million birr	NBE
Physical capital (PK) –proxied by capital formation (investment).	In million birr	MoFED
Human capital development (HCD)-proxied by expenditure on education as % of GDP	Percentage	EEA-CD room
Labour force-employed + unemployed working force	In million	EEA-CD room
Openness-export + import as % of GDP	Percentage	MoFED

Trend Analysis

Inflation and economic growth

The trend of inflation shows the change in the inflation over the study period. Looking at the trends of inflation would enable us to understand the change of inflation during the study period over the years. Further it observes what goes wrong or right at a particular year. The trend analysis in figure 1 below indicates that the country has been experiencing the higher price rise since 2003/2004. In 2001/02, the inflation rate was negative -8.2 percent. In 2003/04, the inflation rate increased to 17.7 percent. But the recovery of the agricultural production and the general economic growth has reduced the inflation rate to 3.2 percent in 2004/05. After 2004/05, the inflation rate could not show any sign of declining till 2008/09. In 2008/09, the inflation reached its highest 44.3 percent.

However, comparing Ethiopia's inflation against the growth rate of real GDP, one may expect a negative relationship between the two as the Ethiopian economy is agrarian and increase output means high food supply and this in turn reduces prices of food items, which account 57% of consumer price index. However, the trend analysis in figure 1 indicates inconclusive pictures about their relation for the period 1974/75 to 2009/10.It depicts almost an inverse relationship in the earlier period. Besides, as can be seen from figure 1 and annex 1, high inflation was occurred at the time of low economic growth when the economy was affected by drought and war (for instance, drought in 1985/86 and war in 1991/92). However, in the later period, between 1993/94 and 2009/10, the trends of inflation and economic growth have reversed and showed positive relation. That is, both high inflation and high economic growth appear together.

Figure 1: Trends of inflation, real GDP and broad money (M2) growth rate
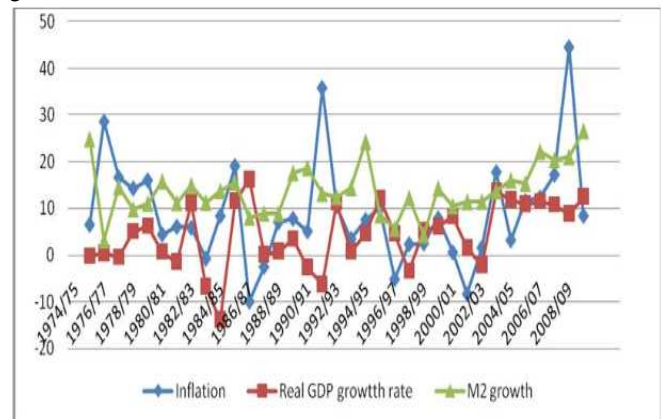
Source: Own computation based on MoFED and NBE data, 2010

Estimation Procedure and Results

Unit root test

In time series analysis, the first step is examining the stationarity of the data used in the regression analysis. There are several ways of testing for the presence of unit root. The most common and popular one in econometric work is the Dickey-Fuller (DF) test due to Dickey and Fuller (1979, 1981) either because of its simplicity or its more general nature (Maddala, 1992; Gujarati, 2003). Therefore, to perform the stationarity test for the variable included in the model, the conventional Dickey-Fuller (DF) and Augmented Dickey – Fuller (ADF) tests are used. The test results reveal that all variables are found to be non-stationary.

However, the test applied to the same variables after first difference become stationary at the conventional 5% level of significance (see annex 1). It means that, all the series are integrated of order (1).

Table 2

	LOG(CPI)	LOG(RGDP)
LOG(CPI)	1	-0.142827877359409
LOG(RGDP)	-0.142827877359409	1

Therefore, the series can be tested for the existence of a long-run relationship (co integration).

Correlation Matrix

Following a Unit Root Test, there is a correlation matrix to detect the correlation between RGDP, and CPI.

Table 2: Correlation Matrix between RGDP and CPI

The result finds negative correlation exists between inflation and economic growth. This negative relationship holds consistent with traditional classical theory, Stockman's neoclassical model and endogenous growth theories, which imply that higher inflation, is negatively correlated to economic growth.

Co integration test

After unit root tests, the next step is to test for the existence of long term Cointegration relationship among the variables. This is checked using the Johansen's multivariate test. Thus, using Johansen's approach of cointegration with one lag for both growth and inflation model, which is determined by Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn Information Criterion (HQIC) with the lowest in AIQ, SIC and HQIC in absolute value is the most efficient one (see table 3 below) indicates that there is one cointegration relationship between variables based on both trace and maximum eigenvalue tests.

Table 3: VAR Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-32.72316	NA	3.33e-08	2.648210	2.975156	2.752803
1	187.9204	323.6105	3.92e-13	-8.794691	-6.179123	-7.957949
2	300.6967	112.7763*	1.02e-14*	-13.04644*	-8.142253*	-11.47755*

* Indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 4: Johansen test results for number of cointegrating

Hypotheses Ho:rank=p	Max Eigen Statistic (l max)	Critical Values (95%)	Trace Statistic-l trace	Critical Values (95%)
p == 0	70.99**	57.1	220**	193
p <= 1	39.57	51.4	149.2	156.0
p <= 2	38.69	45.3	109.6	124.2
p <= 3	22.7	39.4	70.91	94.2
p <= 4	17.29	33.5	48.22	68.5
p <= 5	15.68	27.1	30.92	47.2
p <= 6	7.892	21.0	15.25	29.7
p <= 7	6.093	14.1	7.353	15.4
p <= 8	1.26	3.8	1.26	3.8

** Rejection of the null at 1% level of significance

As can be seen from table 4 above, the trace test indicates that the null hypothesis that there is no cointegration $(r = 0)$ against the alternative $(r = 1)$ is rejected, because, the trace Statistic- $\lambda trace$ (220) is greater than the 95 percent critical value (193). But, the null hypothesis of one co-integration vector is not rejected since the trace Statistic- $\lambda trace$ (149.1) less than the 95 percent critical value (124.2). Similarly, maximum eigenvalue test indicates that the null hypothesis that there is no cointegration vector(r=0) against the

alternative hypothesis of one cointegration vector (r= 0+ 1) is rejected since the test statistic (70.992) is greater than the 95 percent critical value (57.1).

DISCUSSION OF ESTIMATION RESULTS

Long-run estimation results

Before formulating the long run model the significance test on the long run parameters are undertaken. Accordingly, a zero-restriction is imposed on each β coefficients and the result of the test along with their respective probability values are reported on annex. Hence, the long run growth equation with their respective significance test is presented as follows

$$RGDP = -0.27CPI + 0.05HCD + 0.37PK + 0.04Opp\ -0.044DD + 0.29REER\quad 0.29LF + 0.20M2$$

$$[0.1414]\quad [0.6951]\quad [0.0073]**\quad [0.6899]\quad [0.0000]**\quad [0.0009]**\quad [0.0242]*\ [0.0819]$$

Where * and **denotes rejection of the null hypothesis at 1% and 5% level of significance respectively. A value in parenthesis indicates the test of significance.

The result implies that labor force and physical capital development play the main role in increasing economic growth in Ethiopia together with good weather condition (rainfall). For instance, a one percent increases in physical capital and labor force development leads to 0.37 and 0.29 percent increase in economic growth respectively. On the other hand, the positive and significant coefficient of real effective exchange rate revels that devaluation affects economic growth negatively through increasing the cost of production of imported items.

Openness proxy by the volume of trade as percentage of RGDP has insignificant impact towards economic growth. This seemingly contradictory result can be justified by the basic idea that in less developed countries import takes the lion share of the trade volume. These importable items are mainly of consumable goods, which have no significant relationship with investment and ultimately economic growth, and this offsets the positive effect of openness through transfer of knowledge and import of capital goods for production in the long run.

Moreover, the result of our concern variable inflation indicates the insignificant effect on economic growth, which supports that the Mundell-Tobin effect of inflation on output growth through increasing capital accumulation offset by Stockman effect that says that inflation reduces economic growth by increasing cost of investment. This result is in line with the findings of Faria and Carneiro (2001).

The Short-run dynamic (error correction) model

The short run dynamics of the growth model is estimated using the general to specific modeling approach of OLS techniques like that of the inflation model as explained above.

Table 5: Results for the dynamic short run growth equation (DRGDP)

Variables	Coefficient	Std.Error	t-value	t-prob
Constant	0.0793800	0.01899	4.18	0.000
DLRGDP_1	0.811700	0.1619	5.01	0.000
DLRGDP_2	-0.501922	0.1133	-4.43	0.000
DLCPI_1	-0.228652	0.1047	-2.18	0.039
DLPK	0.0620385	0.02975	2.09	0.048
DLHCD	0.157234	0.05676	2.77	0.011
DLOpp_1	0.153537	0.03914	3.92	0.001
DLM2	-0.270179	0.1272	-2.12	0.044
DLREER_1	0.209882	0.04904	4.28	0.000
DLLF	0.121916	0.03370	3.62	0.001
DD	-0.140868	0.01971	-7.15	0.000
ECM_1	-0.752981	0.1994	-3.78	0.001

R^2 0.859009 F (11, 24) = 13.29 [0.000] ** DW 2.2

Diagnostic Test summary

AR 1-2 test: F (2, 22) = 1.1307 [0.3409]
ARCH 1-1 test: F (1, 22) = 0.44769 [0.5104]
Normality test: $Chi^2(2)$ = 2.7922 [0.2476]
Hetero test: F (21, 2) = 0.12154 [0.9977]
RESET test: F (1, 23) = 0.81685 [0.3755]

Authors own construct(above table)

As shown in the above table the various diagnostic tests showed that the model is correctly specified. As indicated above the test summary reveals that there is no problem of error term autocorrelation. That is the test does not reject the null hypothesis of no error term autocorrelation (AR1-2). The test for autoregressive conditional heteroscedasticity (ARCH) failure to reject the null of no ARCH indicates the existence of constant variance. The test for normality cannot reject the null hypothesis of normality and indicates that the error term is normally distributed. Finally, the RESET (regression specification test) does not reject the null hypothesis of no functional misspecification in the estimated equations and it reveals that there is no problem of model misspecification

As in our long run model, the coefficient of the short run model shows the short run elasticity of the variable with respect to the output growth. The coefficient of the first lag of the change in the consumer price index (DLCPI_1) is negative and statistically significant implying that inflation negatively affects output growth in Ethiopia. That is higher rate of inflation reduces output growth and supports the Stockman's effect. Differently, either it outweighs the Mundell-Tobin effect, or it contributes to increased macroeconomic uncertainty, which, in turn, negatively affects economic activity and consequently economic growth. This finding is in line with findings of Barro (1995), Khan and Senhadji (2000), Gokal and Hanif (2004), Ahmed and Mortaza (2005), Seleteng (2004), Sergii (2009), Bettencourt (2010), Salian and Gopakkumar (2009), and Mubarik (2005). Moreover, the one period lag of RGDP has a positive and significant effect on the current change in real GDP growth at 1 percent level of significance. Specifically, a 1% change in real GDP last year will lead to a 0.8% change in real GDP growth in the current period. A 1% change in labor force and physical capital will lead to 0.12% and 0.06% increases in output growth in the short run respectively. Moreover, real exchange rate and openness have also positive and significant effects on output growth in the short run at 1 percent level of significance.

On the other hand, domestic money supply and drought affect output growth in Ethiopia negatively and significantly in the short run. The negative effect of money on economic growth in the short run is by increasing inflation, which results in uncertainty in the economy. Moreover, the coefficient of error correction term (ECM-1), which indicates the rate at which output growth adjust to shocks in the system, has a negative sign as expected and statistically significant at 1% level of significance.

Granger Causality Test between RGDP and Inflation
Granger causality test provides important information of the causal direction between the variables and knowing the direction of causality helps for long-run and short run analysis between the variables.

Table 6: Pair wise Granger Causality Tests
Pair wise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LOG(CPI) does not Granger Cause LOG(RGDP)	34	2.41296	0.0473
LOG(RGDP) does not Granger Cause LOG(CPI)		8.57465	0.0012

The above table shows that both the hypothesis that economic growth does not Granger Cause inflation and inflation does not Granger Cause economic growth is rejected significantly at 5% significance level. This means that there is a bi-causal direction between inflation and economic growth in Ethiopia. For Ethiopia, stabilizing price by reducing CPI will lead to higher economic growth and fast economic growth will reduce inflation.

Estimation of Threshold level of Inflation
The estimated results suggest that for low inflation levels (k < 9) there is an insignificant relationship between economic growth and inflation. For higher inflation level (k > 10) there is a significant negative relationship between economic growth and inflation. Finally, 9-10 percent inflation level is a threshold level, which is obtained by finding that value of k that maximizes the value of R^2 and Minimize the value RSS.

CONCLUSIONS AND POLICY IMPLICATION

Conclusion
One of the main objectives of macroeconomic policy of the Ethiopia economy is to attain sustainable economic growth together with stable price level. However, in recent times the country has been experiencing an increasing price level and the situation has got wide range of concern regarding its effect on economic growth. Hence, the central focus of this study is to identify the nature of inflation-economic growth relationship of Ethiopia from 1974/75 to 2011/12, specifically by using the framework of VAR, vector error correction mechanism using annual data covering the period from 1974/75 to 2009/10. All the variables are tested for unit roots using ADF test and the test result revealed the variables are stationary at their first difference. The result of cointegration

test, using Johansen Maximum likelihood approach, indicates the existence of long run relationship among the variables entered in the models.

The descriptive analysis indicates the trend of inflation and growth. Inflation rate tends to be high when the growth performance of the economy is weak and it falls when the country recorded high growth rate in the earlier time of the study. However, this link seems to have been lost since 2003/04 on wards as both are continuously increasing. Since undertaking a descriptive analysis cannot help to fully address the objectives of the study, the study uses time series econometric analysis to complement the descriptive one.

From the estimated VAR model the short run result indicates that an increase in inflation reduces economic growth in the short run. The long run result of the study has shown that the effect of inflation is insignificant which reflects that the Mundell-Tobin effect of inflation on economic growth is offset by the Stockman effect in the long run. The Granger Causality Test found the bidirectional causal relationship between inflation and economic growth.

Moreover, it is believed that low and stable inflation promotes economic growth and vice versa. And this threshold level of inflation depends on the nature and structure of the economy and varies across countries. Based on the model developed by Khan and Senhadji (2001) the threshold level of inflation is computed. The threshold model estimation recommends 9-10 percent threshold inflation level, which is optimal for economic growth. Above this level inflation affects economic growth negatively.

Recommendations

Based on the analysis made and the major findings obtained the study tries to forward the following policy recommendations;

The long-run negative bi-direction causal relationship between inflation and economic growth suggest that the country should control the level of inflation in order to uphold higher economic growth. The result might be useful for policymakers in providing some indication in setting an optimal inflation target. Policymakers should not exert efforts to keep the inflation rate at low-level percent since inflation below the threshold level (9-10%) does not hamper economic performance. Therefore, controlling moderate inflation should be the main goal for policymakers in Ethiopia.

Here the authors of this research paper have created and contributed a little bit amount of research for the thinkers, believers and policy makers of the country. Not only for the Ethiopian but all developing countries may take this research as an epitome of controlling and sustaining the inflation of their own countries. The authors are very happy to contribute their knowledge to the country's perspective

REFERENCES

[1]. Ahmed, S.and Mortaza, G. (2005). Inflation and Economic Growth in Bangladesh: 1981- 2005, Policy Analysis Unit (PAU) Working Paper 0604.
[2]. Ahortor, C. (2009). Inflation,Capital Accomulation and Economic growth in Imported- dependent Developing Economies. *A paper Prepared for the 14th Annual confernce on EconomicModelling for Africa*, (pp. 1-31). Abuja,Nigeria.
[3]. Barro, R. J. (1995) "Inflation and Economic Growth," National Bureau of Economic Research, Working Paper, No. 5326
[4]. Bettencourt, B. (2010) "Inflation and Economic Growth in Latin America: Some Panel Time- Series Evidence," Department of Economics, University of Pretoria, Lynnwood Road.
[5]. Chaimobi, O. (2010).Inflation and Economic Grwoth in Nigeria,*Jornal of Sustainable Development* , Vol. 3, No. 2(2010).
[6]. Datta, K. and Kumar, C. (2011) Relationship between Inflation and Economic Growth Malaysia, *International conference on Economics and Financial Research*, Vol.4/415- 419
[7]. Dornbusch, R. and Fischer, S. (2001) Macroeconomics, 6th ed. McGraw hill. New Delhi.
[8]. Ethiopian Economic Association (2009): Statistical Data Base, CD ROM. Addis Ababa, Ethiopia.
[9]. Enders, W. (1995), Applied Economics Time Series, John wile and Sons Ltd, New York
[10]. Faria, J, R. and Carneiro, F, G. (2010), Does High Inflation affects Growth in the Long and short- run*? , Journal of Applied Economics*,Vol.4/1,PP.89-105.
[11]. Fischer, S. (1993). The Role of Macroeconomic Factors in Growth, *National Bureau of Economics Research Working Paper, No. 4565*
[12]. Gashaw, T. (2010), "monetary policy shocks transmission to consumer price index: challenge to monetary policy in Ethiopia," paper presented at the Ethiopia economic Association 9th international annual conference, Addis Ababa.
[13]. Greene, W. H. (2000). Econometric Analysis, 4th ed Prentice Hall International, Inc., USA
[14]. Gokal and Hanif, G (2004), Relationship between Inflation and Economic Growth: Economic Department Reserve Bank of Fuji, Suva.
[15]. Gujarati, D.(2003). Basic Econometrics, 4th ed. The McGraw-Hill, Inc., New York.
[16]. Harris, R. (1995), *Using Cointegration Analysis in Econometric Modeling*, Prentice Hall, London
[17]. IMF(2011). *World Economic outlook:* World Economic and Financial Survey, Washington, DC: IMF.
[18]. Iqbal, N. and Nawaz, S. (2010), "Investment, Inflation and Economic Growth Nexus, Pakistan Institute of Development Economics.
[19]. Khan, M. S. and Senhadji, S. A. (2001) "Threshold Effects in the Relationship between
[20]. Inflation and Growth", IMF Staff Papers, Vol. 48(1), pp. 1-21
[21]. Maddala, G. S. (1992), Introduction to Econometrics, 2nd Ed, Florida University, Macmillan, New York.
[22]. Mallik, G. and Chowdhury, A. (2001) "Inflation and Economic Growth: Evidence from South Asian Countries," Asian Pacific Development Journal, Vol. 8, No.1. (2001).
[23]. ankiw, N. G., (2002), Macroeconomics, 5th edition, Worth Publishers
[24]. MoFED (2010), Growth and Transformation Plan, Vol. I and II, Addis Ababa, Ethiopia
[25]. Moseyed, P. and Mohammed, R. (2009), "source of Inflation in Iran: *International Journal of applied Economics and quantitative studies*, Vol. 6-1, PP, 62-76
[26]. National Bank of Ethiopia, 2006/07 annual report, Addis Ababa, Ethiopia.
[27]. Romer, D., (1996), Advanced Macroeconomics, 1st edition, McGeaw-Hill
[28]. Salian, P. and Gopakkumar, K. (2009), Inflation and Economic Growth in India –An Empirical Analysis, Indian Economic Service, New Delhi
[29]. Sergii, P. (2009) "Inflation and Economic Growth: The Non-Linear Relationship. Evidence from CIS Countries," MA Thesis in Economics, Kyiv School of Economics
[30]. Snowdon (2005), Modern macroeconomics: Its Origin, Development and Current State. Edward Elgar Publishing Limited, United kingdom.