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## RESEARCH ARTICLE

# A CO-INTEGRATION ANALYSIS OF MONEY SUPPLY AND PRICE IN ETHIOPIA

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### ARTICLE INFO

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### ABSTRACT

The objective of this research is to show the causality effect between money supply growth and Price level in Ethiopia using a co-integrated Vector Auto Regressive (VAR) model over the period 1975 to 2012. The result of cointegration test, using Johansen Maximum likelihood approach, indicates the existence of long run relationship among the variables entered in both inflation and growth models. To explore the short-run direction of causality between Money Supply and Consumer Price Index (CPI), Granger Causality test has been applied and in order to investigate the existence of long-run relationship, co-integration analysis has been employed. The direction of causation between money and prices, the analyses suggests that the causation runs from money supply to prices, but price level does not causes money supply. Further, the co-integration analysis established that money supply and CPI were found to be co-integrated suggesting an existence of long-run relationship.

#### Key words:

Cointegration, Granger causality, Money supply, price level

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### INTRODUCTION

Inflation can be defined as a sustained or continuous rise in the general price level or, alternatively, as a sustained or continuous fall in the value of money. Several things should be noted about this definition. First, inflation refers to the movement in the general level of prices. It does not refer to changes in one price relative to other prices. These changes are common even when the overall level of prices is stable. Second, the rise in the price level must be somewhat substantial and continue over a period longer than a day, week, or month. However, if the rise is a continuous drop instead, it is called deflation.

There are many measures of inflation, because there are many different price indices relating to different sectors of the economy. Two widely known indices for which inflation rates are reported in many countries are the Consumer Price Index (CPI), which measures the rate of change in the prices of goods and services bought by the consumers, and the GDP deflator, which measures prices of locally-produced goods and services.

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 the year

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)

Historically, the Ethiopian economy was known for its low inflation. Prior to 2003/04, the country has not suffered from high inflation. The major hikes in the general price level occurred during the times of war and drought only. However, after 2003/04 it has experienced high inflation following government's move towards less conservative monetary and fiscal policy, and active participation in the economy. For instance, during 2004-2010 annual inflation average was 15.4% for Ethiopia, which is higher than the Sub Saharan Africa average of 8.8% for the same period (IMF, 2011).

After reaching its peak, inflation was significantly reduced in 2009/10. For instance, the headline inflation, which went up from 15.5% in May 2006/2007 to 41.6% in May 2008/2009, went down significantly to 2.4% in May 2009/2010 (EEA database, 2009/2010). The different fiscal, monetary and administrative policy measures taken by the government and the decline of commodity price in the international market may be the factors behind it. However, beginning from the end of 2009/10 inflation has been increasing again (for instance, it climbed to 34.7% in May 2010/2011). This high price development puts inflation as the major concern, and it is also

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fair to say that the discussion surrounding this variable for the last few years in Ethiopia has always been colorful and debatable about its source

Over the last few years there has been also sharp increase in money supply. Broad money has grown from 30.5 billion Birr in 2002/03 to 56.7 billion in 2006/07. The share of broad money as a percentage of GDP has also shown a marked increase jumping from 42.7 in 2002/03 to 53 percent in 2006/07 (NBE, 2006/07). On fiscal front, there has been huge increase in government expenditure as the government embarked on huge capital projects. Despite the fast increase in expenditure, the government's budget deficit (including grants) as a percentage of GDP has fallen considerably. The means of financing the budget deficit has shifted from external to domestic bank and nonbank sources. This has led to the monetization of the deficits. The use of domestic means of deficit financing as percentage of budget deficit has grown from 34.4 percent in 2002/03 to 63.8 percent in 2006/07 (MoFED, 2007/08). There has also been increase in domestic revenue following the introduction of value added tax (VAT). Export receipts have also improved due to diversification of exports and recovery of international prices of commodities. During the same period of 2002/03, the government expenditure has also grown considerably. There has also been fast increase in money supply mainly as a result of growth in fiscal deficits. Studying the linkage between price developments and money supply will, therefore, enable understand the short run and long run relationship of them in Ethiopia.

### **Statement of the Problem**

Modeling the relationships between money supply and price level has been one of the main controversial issues of interest for economists, researchers, and policy makers. This is simply because a clear understanding of the relationship between these macroeconomic variables is of crucial importance, particularly to the policymakers in ensuring that effective macro-economic stabilization policies can be designed and implemented effectively. Although economic theory suggests the mechanisms through which these variables could influence each other, the issue has been a subject of considerable debate. Over the years, a number of approaches have been developed which allow us to more fully explore the causality lies behind the connection between these variables.

This relationship has been extensively investigated in both, theoretical and empirical literature by researchers for both developed and developing countries over different sample periods and provided the conflicting evidences on this issue. Theoretically, it has been a debated issue among economic schools of thought particularly between the Monetarists and the Keynesians. The monetarists claim that changes in money stocks cause changes in price levels.

In other words, the direction of causation runs from money to prices implying that prices can be controlled through money supply. The Keynesians, on the other hand, argue that money is important but is not responsible for changes in price levels. Instead, structural factors play important role suggesting that

money supply is not an effective instrument to control price changes.

Furthermore, like the contradicting theoretical views about causal relationship between money and prices, there is also lack of consensus in the previous empirical findings about causal relationship between money and prices. For example, [Brillembourg and Khan \(1979\)](#) examined this relationship in USA. Using Sims procedure for the period 1870–1975, they found unidirectional causality running from money to prices. Similar directions of causation are reported by [Lee and Li \(1983\)](#) and [Ramachandran and Kamaiah \(1992\)](#) who investigated the causal relationship in Singapore and India respectively. On the other hand, [Aghevli and Khan \(1978\)](#), while investigating the causal relationship in Brazil, Columbia, the Dominican Republic, and Thailand, found bidirectional causality between money and prices in these countries. See also [Ramachandra \(1986\)](#), [Miller \(1991\)](#), [Friedman and Kuttner \(1992\)](#), [Stock and Watson \(1993\)](#) [Boucher and Flynn \(1997\)](#), [Jamie Emerson \(2005\)](#), [Herwartz and Reimers \(2006\)](#) [Majid \(2007\)](#) [Saatcioglu and Korap \(2008\)](#).

To the best of our knowledge, there has not been empirical analysis for the long run and short run relationship between two important macroeconomic variables, namely money supply (MS), and the Price level (CPI), in the context of the Ethiopian economy. This paper seeks to redress this gap by examining the short run and long run direction of causality between these two variables to produce a theoretically justified model of monetary relationships in the Ethiopian economy with good fit to the data. Knowing the structural behavioral relationships in the monetary sector of the economy it would be possible to say whether monetary supply affects inflation in Ethiopia and whether money supply is “good” intermediate targets for the monetary policy. On the other hand the model would show how quick (if any) is the response of monetary supply to changes in its targets. Definitely, such a model could be of help for the policymakers and the economists in their design of new monetary policy framework. Understanding the strength of the behavioral relationships for the monetary supply and their lags will help policymakers to better calibrate their monetary policy actions, improve their timing and better achieve their inflation targets. Thus, examining relationship between money supply and price level in Ethiopia is very important. Therefore, the motivation is to fill the indicated gap. The questions that this paper seeks to answer include the following.

- Is there a short run and long run relationship between money supply and price in the Ethiopia economy?
- What is the direction of causality between money supply and price in Ethiopia?

### **Objectives of the study**

The main objective of this study is to investigate the relationship between money supply and price level in Ethiopia.

### **The specific objectives are**

To achieve the general objective the targeted specific objectives are:

1. To identify the short run and long run relationship between money supply and price in the Ethiopia economy
2. To identify the direction of causality between money supply and price in Ethiopia
3. To indicate possible policy implications based on the finding.

## MATERIALS AND METHODS

### Theoretical framework and model specification

The building block for this study is the quantity theory of money, which states that there is a relationship between money supply, velocity of money, prices, and real income, and can be written as an identity

$$MV=YP \text{-----}(1)$$

Where; M, V, Y and P are money supply, velocity of money, output and general price level for home country respectively. The theory assumes that V and Y are constant in the short term and the change in price level is proportional to the change in money supply. The above equation can be expressed as:

$$P=MV/Y \text{-----} (2)$$

Taking log of equation (2), yields

$$\log P = \log M + \log V - \log Y \text{-----}(3)$$

Besides the aforementioned variables, following the works of (Tidiane, 2011, Hang and Thanh, 2010, Olusanya, 2008, Alemayehu and Kibrhom, 2008) the study will employ the following econometric model to examine relationship between money supply and price level in Ethiopia that comprise both the structural (cost-push) and the monetarists (demand-side) approach along with policy variables and adaptive expectations which helps to control the effect of other variables on inflation, then the basic model becomes:

$$CPI = S_0 + S_1 NEER_t + S_2 FCPI_t + S_3 M^2_t + S_4 RGDP_t + S_5 EXINF_t + S_6 BD_t + S_7 IRr_t \dots\dots\dots 4$$

Where CPI is domestic consumer price index, NEER is nominal effective exchange rate, FCPI is the foreign consumer price index, RGDP real gross domestic product, EXINF is expected inflation, IR is interest rate, and all variables are in long form except interest rate and expected inflation Adding error term ( $\mu$ ) to capture effect of other variables, we specify the econometric (Estimable) model to analyze inflation in Ethiopia as:

$$CPI = S_0 + S_1 NEER_t + S_2 FCPI_t + S_3 M^2_t + S_4 RGDP_t + S_5 EXINF_t + S_6 BD_t + S_7 IRr_t + \mu_t \dots\dots\dots 5$$

### 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 may 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
Foreign consumer price index(FCPI)	Index number	UNCTAD
Nominal effective exchange rate(NEER)	Index number	NBE
Real Gross Domestic Product(RGDP)	In million birr	MoFED
M2-broad money supply	In million birr	NBE
Budget deficit as percentage of GDP	Percentage	MoFED

### Methods of data analysis and estimation technique

Since, the variables included in the model to examine the relationship between money supply and price level are interrelated time series variables. That is, any change in any one of these variables may directly or indirectly affects the others. Hence, it is important to consider a suitable methodology to analyze the interaction and interrelationship among these variables. Therefore, vector autoregressive (VAR) model will be used to analyze the interaction and relationships between FDI and its determinants.

Unlike, the simultaneous equation, which requires predetermined relationship among the variables of interest, VAR model treats all the variables of interest as endogenous and exogenous variables simultaneously. Thus, estimation of VAR model is simple. Sims (1980) argues that if there is true simultaneity among a set of variables, they should all be treated on an equal footing; there should not be any priori distinction between endogenous and exogenous variables (Gujarati, 2004). Therefore, we will use the unstructured VAR model to analyze, estimate and forecast the relationship among the variables of interest.

Therefore, analyzing time series data using VAR model involves the following essential steps: Stationarity test, lag length selection, co-integration test, estimate Vector error correction model, Granger causality test, and finally performing innovation accounting analysis (Gujarati, 2004).

### Data Analyses and Interpretations

The data analysis part constitutes both descriptive and econometric method. The descriptive method is used to assess the trends of inflation with time, and the cross plot of price level with money supply to see their relationship graphically since 1974/75, whereas the time series econometric technique is used to estimate the long run and short run relationship between money supply and inflation and their direction of causality will be determined using VAR and SVAR. Secondary data are used for the purpose of study.

### Trends of Inflation

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 2 below indicates that trends of inflation show moderate ups and downs from 1974 to 2002 with exceptions of 1976, 1985, 1991-92 and 1996. In 1985 there was a devastating drought which claims the life of many Ethiopian and also created the current image of the country in the world. Since the country depends on rain fed agriculture as a main source of income, the drought diminished output growth which in turn has a significant influence on the increment of inflation. In 1991-92 there was a political transition in country and later in 1998 there was a war with Eritrea which also affected progress of the economy. 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.

The major sources which make the inflation rate to increase at an alarming rate includes increase in money supply, the nature of investment in the country, widening of the national deficit and ways of financing it, and others (Geda and Tafere, 2008; Goodo, 2008; Seid, 2008).

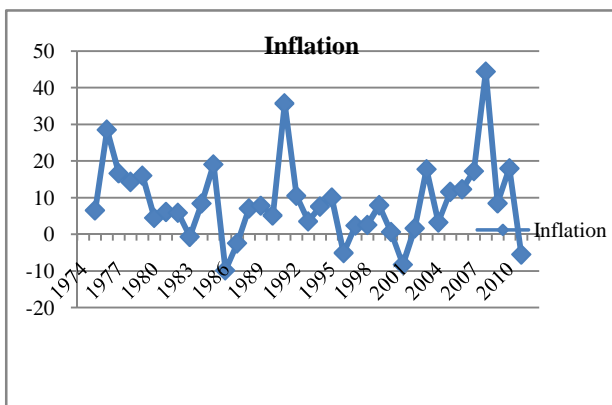


Figure 1 Trends of inflation

Source: Own computation based on MoFED and NBE data, 2010.

It indicated that the growth rate of money supply was greater than that of real GDP growth, *citreois paribus*, implying that money supply has been growing at a higher rate and leads to increase in general price level. Besides, as shown in figure 1 above almost in all the study period, except the period at which inflation reached at its peak the growth rate of money supply was above the rate of inflation. Moreover, after 2000 growth rate of money supply could not show any sign of declining and it seems that money supply growth derives inflation up. In addition to the trend analysis the cross plot below in figure 2 more clearly explains the positive relationship between inflation and money supply. This supports the current situation in Ethiopia, which the government and stock holders insisted that money supply is one of the sources of current inflationary pressure.

**Econometric Estimation Results and Discussions**

In this part of the analysis, the time series econometric method was employed to estimate the relationship and the direction of causality between our interest variable. Eviews 5 econometric software was also used for all econometric method of analysis.

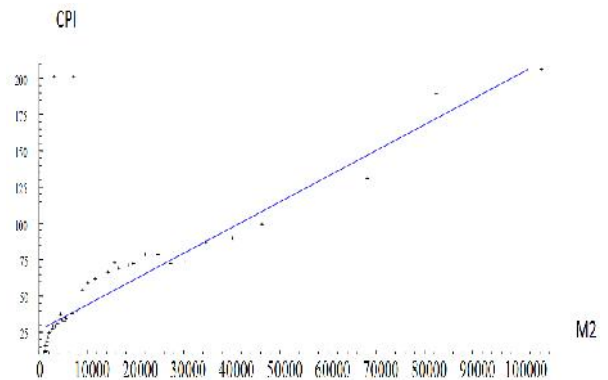


Figure 2 Cross plot of inflation on money supply

**Unit Root Properties of Individual Variables**

Table 2 depicts the stationary test for the variables included in the model. From the table it is clear that the null hypothesis of a unit root is rejected for all variables with a drift term (constant).

Table 2 Result of unit root test after first difference

	Lag length 0		Lag length 1		Lag length 2	
	Constant	Constant and trend	Constant	Constant and trend	Constant	Constant and trend
DLCPI	-4.554**	-4.571**	-3.498*	-3.415*	-2.195	-1.995
DLRGDP	-4.645**	-5.316**	-4.722**	-6.259**	-2.119	-3.182*
DLNEER	3.861**	-3.857**	-3.457*	-3.481*	-3.505*	-3.567*
DLFCPI	-4.318**	-4.333**	-4.071**	-4.135**	-3.229*	-3.301*
DLM2	-3.167*	-3.655**	-1.864	-2.345	-1.198	-1.655
LBD	-7.522**	-7.577**	-4.637**	-4.770**	-3.691**	-3.866**

**Inflation and money supply (M2)**

A monetarist states that monetary policy has a positive and direct impact on inflation. Looking the trend of broad money supply (M2) with inflation in figure 1 above supports the theoretical and empirical literature and reveals positive relationship between the two. Between 1974/75 and 2010/11 money supply has on average grown by 13.9%, while real GDP has grown on average by 4.4% in the same period.

Moreover, the null has been rejected for lag one of all variables at one and five percent level of significance. Therefore, it is possible to conclude that the variables are integrated of order one I (1).

**Where; \*\* and \* represents rejection of the null hypothesis**(which says the data has a unit root) at 1% and 5% significant level respectively and critical value of 1% is -3.623 and -4.2436 with constant only and with constant and trend,



respectively; and 5% critical value is -2.948 and -3.544 with constant only and with constant and trend, respectively.

**VAR model specification**

**Estimating for Order of the VAR**

For determining the appropriate lag length for the VAR model the Akaike information criterion (AIC), Schwarz information criterion (SC), Hannan-Quin (HQ) information criteria were used. In table 3 the lag length selection criterion is tabulated. The AIC, SC and HQ test suggest appropriate lag length for the VAR model is one (1). Specifying the lag length has strong implications for subsequent modeling choices. Choosing too few lags could lead to systematic variation in the residuals whereas if too many lags are chosen it comes with the penalty of fewer degrees of freedom.

In the following table the lag length selection criterion is tabulated. The AIC, SC and HQ test suggest appropriate lag length for the VAR model is two (2). That is, the best fitting model is the one that minimize AIC or SC or HQ .

**Table 3** VAR lag order selection results (Eviews 5 output)

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

**Co integration Analysis**

Following the unit root tests and lag length section cointegration test was carried out using the Johansen (1988) cointegration method. The results of VAR (1) cointegration are shown in table 4 below. The maximum value was greater than critical value at zero co-integrating vector (r =0) for both trace test and Maximum-Eigen value test. This indicated the existence of one co-integrating relationship. Thus the above table shows that the null hypothesis of no co-integration is rejected at the conventional level (0.05) and the study conclude that there exists a relationship among the proposed variables in the long run. Trace test and Eigen value test indicates that there are one co-integrating vector. All the variables are co-integrated of order one having the long run relationship.

**Table 4** Johansen test results for number of cointegrating vectors

Hypotheses Ho:rank=p	Max Eigen Statistic ( } max )	Critical Values (95%)	Trace Statistic- }trace	Critical Values (95%)
p == 0	209.2**	51.4	330.1**	156.0
p <= 1	33.37	45.3	121	124.2
p <= 2	27.82	39.4	87.59	94.2
p <= 3	22.67	33.5	59.77	68.5
p <= 4	17.93	27.1	37.1	47.2
p <= 5	11.31	21.0	19.17	29.7
p <= 6	6.225	14.1	7.864	15.4
p <= 7	1.639	3.8	1.639	3.8

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

**Long run estimation results**

The presence of one cointegration vector is supported by the Johansen cointegration test statistics, thus we can formulate the long run equation from the coefficient of the cointegration regression result. For this purpose, the first row of is important. As indicated in annex 1, the first row of represents the long run coefficients of the variables

Thus, the long run normalized inflation equation with the corresponding signs and significance is presented as follows:

$$LCPE = -0.931LNEER + 2.66LRGDP + 0.303LM + 1.11LFCP + 0.105LBD + 0.776EXIn + 0.021Lir$$

(0.0468)\*                      (0.0541)                      (0.7522)                      (0.0187) \*

(0.1112)                      (0.0000)\*\*                      (0.2887)

Before interpreting the results of the model its adequacy is checked by using different diagnostic tests. The normality test using Jarque-Bera test of normality indicates that we fail to reject the null hypothesis of residual multivariate normality for the variables jointly and individually because probability values are high.

Similarly, the test results reveal our failure to reject the null hypothesis of homoskedasticity and no residual autocorrelation, since the P-values are reasonable high in both cases (see annex 2).

The results of the study show that money supply is found to be insignificant impact in the inflationary process in the long run. The insignificant result of money supply in the long run reveals that the increase in money supply in the short run increases price by increasing aggregate demand with lag in output response. However, in the long run output increases and reduce the price level of goods which offset the short run increased price. This finding is in line with the findings of Loening et al (2009).

**The Short-run dynamic (ECM)**

After determining the existence of long run relationship among the variables, the next step is to set up the short run dynamic or the error correction model. It is obtained by estimating the first difference of the dependent variable on its own lag, on the first difference of all explanatory variables and their lags and also including one year lagged error term which is obtained from the long-run model estimation. The reason for including one year lag of the error term is to indicate how the time path matter to correct any error or deviation from the long run equilibrium.

The change in the variables entered into the model to represent variation in the short run, while the coefficients obtained from the error correction term will represent the speed of adjustment towards the long run equilibrium relationship. As shown in the long run the existence of one co-integrating vector is supported by the Johansen cointegration test. This indicates that there is no problem of simultaneity. Therefore, Ordinary Least Square (OLS) will be efficient and can be used in this case to estimate the short run dynamics. Thus, the parsimonious error correction model can be estimated using OLS technique, starting from a general over parameterized model. This means that the short run dynamic model is subjected to a systematic reduction and testing process until a robust parsimonious model is obtained. Following the above specification, the following short run model is obtained.

is no autocorrelation problem, as its value is reasonably close to two.

The estimated result of the short-run model shows that the main drivers of inflation in the short-run are money supply, real GDP, expected inflation, interest rate and foreign price. As shown in the above table, the lagged values of LCPI is positively and significantly influenced the behavior of current inflation. Specifically, the coefficient of expected inflation is positive and significant at the 1% significant level which is consistency with its long run result. That is inflation expectation is the main drivers of inflation in Ethiopia both in the long and short run. Similarly, the effect of foreign price is also significant in both the long and short run model. This significant effect of foreign price both in short and long run revealed that imported or pass through inflation is one of the main drivers of domestic inflation both in the long and short run.

The coefficient of the fiscal variable (ratio of budget deficits to GDP) is not significantly different from zero, both in the short and long run. This is similar with the findings of Khan & Gill (2010). This insignificant impact of the fiscal variable, in spite of the fiscal dominance in Ethiopia, may be due to the inclusion of money supply and expected inflation in the analysis, both of which reflect deficit financing.

**Table 5** Results for the dynamic short run inflation equation (DLCPI)

Variable	Coefficient	Std.Error	t-value	t-prob
DLCPI_2	0.383487	0.1661	2.31	0.029
Constant	-0.117060	0.04902	-2.39	0.024
DLRGDP_1	-0.946592	0.2181	-4.34	0.000
DLM2	0.869588	0.2621	3.32	0.003
DLM2_1	0.741052	0.2406	3.08	0.005
DLFCPI	0.267028	0.1031	2.59	0.015
DLLir_2	-0.205519	0.08667	-2.37	0.025
ECM_1	-0.378868	0.1601	-2.37	0.025
R <sup>2</sup> 0.581798 F (7, 28) = 5.565 [0.000] ** DW 1.7				
<i>Diagnostic test summary</i>				
AR 1-2 test: F (2, 26) = 0.76675 [0.4747]				
ARCH 1-1 test: F (1, 26) = 0.51191 [0.4807]				
Normality test: Chi <sup>2</sup> (2) = 5.1779 [0.0751]				
Hetero test: F (14, 13) = 0.32352 [0.9775]				
RESET test: F (1, 27) = 1.7498 [0.1970]				

Similar to the long run regression results, before interpreting the short run dynamic regression result, the adequacy of the model is checked by using different diagnostic tests. 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. Moreover, as shown in the above table all explanatory variables together explain about 60.1 percent of the variation in the model. The F statistics rejects the null hypothesis that all the coefficients in the model are jointly insignificant. Durban Watson (DW) test also suggests that there

Other explanation for this may be that the impact of budget deficit depends upon the methods of covering the deficit and it may not be always inflationary. However, in Ethiopia most of the time budget deficit is financed by money creation which is inflationary. Thus, the insignificant effect of budget deficit in this case may be due to the first reasons than the second once.

As can be seen from the result above, inflation is negatively related to real GDP and for a one percent increase in the lag of real income inflation decreases by 0.98 percent. Because, the Ethiopia economy is agrarian more GDP means more agricultural output and this in turn reduces inflation, especially price inflation of food items which comprises 57% of CPI.

The result of interest rate is as expected. The result has shown that a 1 percent increase in the two period lagged interest rate would lead to decrease in CPI by 0.2 percent. It implies that the increase in interest rate increases the cost of borrowing which in turn decreases money supply which in its turn also reduces

aggregate demand and then inflation. On the other hand, increase in interest rate can reduce money supply by encouraging saving and this in turn reduces inflation. Moreover, the present and the lagged value of money supply affect inflation positively in the short run. The coefficient of one period lagged change in money supply is positive and significant at one percent level of significance. More clearly, a last year increases in money supply by one percent will lead to a 0.87% increases in the current period domestic price level. Moreover, a one percent increase in current money supply will results in 0.74 percent increase in the price level.

The one year lagged error correction mechanism (ECM-1) included in the model to indicate how the time path matter to correct any error or deviation from long run equilibrium relation occurring in the previous period is correctly signed (negative) and significant at 5 percent level of significance. It points out that about 37.8 percent of the disequilibrium from the long run path will be corrected in one year. The magnitude of the coefficient also indicates that there is somewhat medium level of correction for divergence of general price level from equilibrium. The speed of adjustment further indicates that it takes almost three years for any deviation or disequilibrium to be fully adjusted. Put differently, the percentage shows how fast short-run deviations in price changes adjust to its long run values.

In sum, the significant determinants of inflation in the short run, therefore, include; money supply, real GDP, inflation expectation, foreign price and interest rate.

**Granger Causality Test between Price and Money `supply.**

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** Pairwise Granger Causality Tests

Pairwise Granger Causality Tests			
Null Hypothesis:	Obs	F-Statistic	Probability
LOG(M2) does not Granger Cause LOG(CPI)	37	4.97634	0.01313
LOG(CPI) does not Granger Cause LOG(M2)		0.82880	0.44573

The table shows that the hypothesis that L(M2) do not Granger caused L(CPI) is rejected and L(CPI) does not Granger caused L(M2) is not rejected. This means that there is a unidirectional causality between money supply and price. That is, there is no Granger Causality from price level to money supply. Therefore there is unidirectional Granger causality from money supply to price level.

**CONCLUSIONS AND POLICY IMPLICATIONS**

**CONCLUSIONS**

The central focus of this study is to identify the relationship between money supply and inflation, specifically by using the framework of VAR and vector error correction mechanism

using annual data covering the period from 1974/75 to 2011/12. All the variables are tested for unit roots by Augmented Ducky Fuller test and the test result revealed the variables are stationary at their first difference

The result of co-integration test, using Johansen Maximum likelihood approach, indicates the existence of long run relationships between the variables in line with previous research in other countries. This means that money supply and prices move together in the long-run.

The study distinguished the existence of long run and short run equilibrium relationship running from money to prices (unidirectional relationship from money supply to CPI by using the causality testing procedures of Granger causality.

**Policy implications**

Based on the findings of the study the following policy implications are suggested:

- Encouraging and expanding domestic import substituting industries to reduce the effect of imported inflation through foreign price and exchange rate change
- The monetary authority shall take into consideration the inflationary effect of money supply so as to ensure stable price level.

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