Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.41, 2015

Determinants of Food Price Inflation in Ethiopia

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Abstract
This paper explores determinants of food price inflation in Ethiopia during 1971-2013. Based on empirical and theoretical literature, the OLS estimate contain the dependent variable which is Food price inflation as a function of major explanatory variable i.e. money supply, Real GDP, Inflation expectation and world food price. The empirical result reveals that Food price in Ethiopia is determined both demand (money supply and expectation) and supply (output and world food price) factor. The short run dynamic error correction equation depicts that all the variables except money supply are statistically significant at 5% level in the model and they have expected sign. The finding also revealed that the adjustment coefficient for the estimated food price equation is statistically significant at 1% level and negative. It is incredibly fine with about 97 percent convergence of the short-run shock existing last year towards its long-run path in the current year.

I Introduction

Price stability is one of the principal economic goals in any economy. It is desirable that the overall price level for goods and services remain relatively stable. Price stability is always one of the common objectives of economic integration policies and has been a strategic one for monetary policy of the West African Monetary Zone (Tucker, 2003). Inflationary pressures are known for its negative impact on social welfare and disable the domestic economy from performing efficiently (Fullerton, et al 1997). Therefore reducing inflationary rates is a top priority in any economic policy agenda.

According to FAO report, annual food price inflation fell globally to 5.2% in 2014, the lowest rate in the last four years. All regions saw annual food inflation decreasing from 2011 to 2014, except Latin America and the Caribbean, where food price increase accelerated from 8.4% in 2011 to 9.7% in 2014. The most remarkable decrease was recorded in Africa, where annual food inflation halved from 12.8% in 2011 to 6.3% in 2014. In the same period, Northern America and Europe experienced the lowest food inflation rate, Latin America and Caribbean, Asia and Africa the highest. Within 2014, global food inflation fell from a high of 6% year-over-year in January to a low of 4.4% in November, before rising to 5% in December when food price inflation rose almost all regions, but in particular in Asia and Eastern Europe. Short term forecasts predict declining food price inflation throughout the first quarter of 2015, down to 4.6% in March 2015.

In Ethiopia, head line inflation shows somewhat stable trend which is almost between 5-9 percent since March 2013 until now. In August 2011 the head line inflation was very high and reaches 40.6% and the lowest in august 2010 which was nearly 5.3 % compared to all preceding years and months. Currently head line inflation show some increment due to increase in food and non-food inflation, it registered 9.5% in May 2015.

Regarding to food inflation, it has relatively stable growth rate up to first quarter of 2010. Starting from third quarter of 2010 up to second quarter of 2012 it registered high annual food inflation rate it jumps from single digit to double digit. The trend of food inflation showed the highest growth rate from February 2011 and reached its peak of 51.7% in October 2011. In recent periods, the food inflation level shows some increment trend since November 2014 till May 2015 it was 10.2%.

Hence food inflation show more volatile trends than non-food inflation and it take also a lion share for the volatility of head line inflation, it is thus of vital importance to improve the understanding of the causes of food price inflation and its dynamics in Ethiopia to allow adequate policies in order to achieve the price stability objective. Therefore, this paper thoroughly analyzes the determinants of food price inflation and its dynamics in Ethiopia using time series data.

The general objective of this paper is to assess the determinant of food price inflation in Ethiopia by suing OLS method.

It is important to delimit the scope of research to a manageable size. Inflation is not unique to Ethiopia and many other developing countries; to some extent every country in the world faces inflation. However, this paper was restricted to food price inflation in Ethiopia out of the general index (inflation). The reason behind this is the impact of food price instability is high on head line inflation.

This study makes an effort to show that a trend of food price inflation is an enormous treat or opportunities to Ethiopia. The finding of this paper on food price inflation may help donors, researchers and specially policy makers who are concerned with the economic situation prevailing in Ethiopia.

The reminder of this paper is organized as follows: chapter one incorporate the introduction part. Chapter two provide literature review. Chapter three illustrates data and methodology. Chapter four discussed descriptive and econometric analysis. Finally chapter five discusses conclusion and recommendations.

II Review of the Literature

2.1 Theoretical literature

Here this paper has discussed the two major factors for the increment of food price:

2.1.1 Structural and Cyclical factors

Structural factors are fundamental in explaining what has happened to international food grain prices in recent years. Jhingan (1997) summarized structural inflation as follows: "Thus structural inflation may result from supply inelasticity leading to rise in agricultural prices, costs of import substitute deterioration of the terms of trade and exchange rate deprecation". Another structural factor is the rising scarcity of oil driven by the stagnation of supplies from the Organization of the Petroleum Exporting Countries (OPEC) and decline in production in non- OPEC economies

Cyclical factors as well have been unkind in influencing food price trends. The main cyclical factor is adverse weather condition including the drought-related and flooding have harmed production.

2.1.2 Demand and supply factor

The most important demand factors in the rise in food prices in recent years are long-term in nature and can also be thought of as supporting the view that structural rather than cyclical factors are predominant. Among these demand-side factors are growing world population, increase in money supply and strong income growth in emerging economies around the globe.

On the supply side, urbanization and competing demand for land for commercial as opposed to agricultural purposes is an important factor.

2.2 Empirical literature country experience

Christopher Adam et.al (2012) have developed an empirical representation of inflation in Tanzania for the period starting from January 2002 to July 2011, estimating 'multiple-determinant' single-equation models for month-on-month headline inflation and its principal components (food, energy and core inflation). The results suggest that while supply-side factors, including yield variability and international price arbitrage, play a major role in determining domestic food and fuel inflation (which together account for almost 60 percent of the total CPI basket), demand-side factors amenable to policy intervention by the monetary authorities anchor core inflation.

Mumtaz Ahmed and Naresh Singla (2014) have exclusively analyzed the major determinants of food inflation in India by using the monthly data from January 2006 to December 2013. Using Johansen's co integration technique, it was shown that in long run, all major determinants of food inflation such as money supply, interest rate, exchange rate, crude oil and rainfall except world food prices affect food inflation significantly. The Error Correction Model was also used to comprehend the short run behavior of food inflation and its determinants. The error correction term turned out to be significant statistically which further confirmed the long run causality as well as the speed of convergence towards long run equilibrium. In the short-run, only world food and crude oil prices affect the food inflation.

Muhammad Abdullah and Rukhsana Kalim (2012) have examined main determinants of food price inflation in Pakistan. Using the data from 1972 to 2008, Johansen's co-integration technique is utilized to find out the long run relationships among food price inflation and its determinants like inflation expectations, money supply, per capita GDP, support prices, food imports and food exports. Empirical findings prove the long run relationships among food price inflation and its determinants. All the determinants affect food price inflation positively and significantly except money supply which is insignificant with correct positive sign. In the short run, only inflation expectations, support prices and food exports affect the food price inflation. The results reveal that both demand and supply side factors are the determinants food price inflation in Pakistan. However, the study supports the structulists' point of view of inflation as money supply shows insignificant results.

2.3 Food price Inflation in Ethiopia

Ethiopia's inflation trajectory has received relatively little empirical attention. Nevertheless, a few studies have emerged in the light of Ethiopia's food price crisis, drawing mainly on logical deductions and descriptive analysis. They subsequently review the most important ones. Most of these studies take a general approach, identifying and discussing various possible factors contributing to inflation.

The Ethiopian Development Research Institute (EDRI), a government think tank, has put forward several hypotheses, summarized by Ahmed (2007). Increases in aggregated demand should a priori put pressure on demand for food, resulting in acceleration of food inflation. Yet, the puzzle is that agriculture has been leading the fast growth in the economy, so crop production has seen substantial growth during the period. This seems to undermine the potential role of aggregate demand in explaining Ethiopia's recent food inflation. Changes in the structure of the economies, following a sustained rapid growth in agriculture, are viewed as a potentially better explanation for the price increases. These include behavioral changes leading to increased commercialization of crop production and reduced distress selling by peasants, which might have significant implications for aggregate demand and prices. Ahmed (2007) also lists various other domestic and external factors, including money supply and world commodity prices.

Dorosh and Subran (2007), using the official data and partial equilibrium simulations, they find that relative price changes for major cereals are broadly consistent with changes in domestic demand and supply during 2003-2007.

The World Bank (2007) also suggests that activities of cooperatives may be improving the bargaining power of farmers, thus raising food prices. However, the shift from food aid to cash transfers seems to have had very negligible effects on market prices

Similarly, the International Monetary Fund (IMF, 2008a) suggests that multiple factors account for the recent increase in food price. Since inflation is higher in Ethiopia than in neighboring countries, domestic factors, including demand pressures and expectations should be important. Some supply-side factors may also explain part of the rise in food prices, such as reduced distress selling by farmers equipped with better access to credit, storage facilities, marketing information systems, and the switch from food to cash aid.

Josef L Loening et al (2009) have examined inflation dynamics and food frices in an Agricultural Economy: The Case of Ethiopia. Using monthly data, the authors estimate error correction model to identify the relative importance of several factors contributing to overall inflation and its three major components, cereal price, food price, and non-food price. The main finding is that, in a longer perspective, over three to four years, the main factors that determine domestic food and non-food price are the exchange rate and international food and goods prices, in the short run, agricultural supply shocks and inflation inertia strongly affect domestic, causing large deviation from long-run price trends. Money supply growth does affect food price inflation in the short run; although the money stock itself does not seem to drive inflation.

III Econometric Analysis and Interpretation

3.1 Methodology

3.1.1 Data Source

The study depends on a data collected from secondary source and the source is annual report of NBE, MoFED and CSA. Table 1 lists the different source of data used in this study.

Table 1 Source of data

NBE	MoFED	World Bank
Food index	GDP supply side	World food price
Broad money		

3.1.2 Method of Data Analysis and Model Specification

To figure out the determining factor of food inflation in Ethiopia both descriptive method and time series econometric is used with 1971-2013 data series. In the econometric method both ordinary least square and error correction method employs to determine the long run and short run as well as determinants of food inflation in Ethiopia. In doing so E-views softer package are employed.

Before specify the model let us overview the main argument underline by different theory

- The structuralist argues that the inadequacy of food supplied to feed a growing and increasingly urbanized population have pushed up the price of food.
- The Keynesian demand-pull argues that an excess demand in the good market represented by an upward shift in the aggregate demand schedule, leads to an increase in the price.
- According to the purchasing power parity (PPP), expectations of future inflation are another important determinant in inflation. There are two categories of expectation can be outlined namely adaptive and rational expectation. Adaptive expectation on inflation based on recently observed inflation and this may affect the general price level. Rational expectations on the other hand, assume that people use all the available information including that about current policies to forecast the future.
- Ahmed (2007) hypothesized and fined that increases in aggregated demand should a priori put pressure on demand for food, resulting in acceleration of food inflation. He also lists various other domestic and external factors, including money supply and world commodity prices.
- According to Josef L Loeining et al 2009, Money supply growth does affect food price inflation in the short run; although the money stock itself does not seem to drive inflation
- Loaning (2007) suggest expectation can explain a large fraction of inflation dynamics in Ethiopia for 2000-2006.

Now based on the theoretical model and empirical model the paper specify the model as follow as;

$FPI_t=f(WFP_t, RY_t, M_2, FPE_t)$

The log linear model:

$$LnFPI_t = \alpha_0 + \beta_1 LnWFP_t + \beta_2 LnRY_t + \beta_3 LnM_2 + \beta_4 LnFPE_t + +\varepsilon_t$$

Where:

FPI^t – Food Price Index

WFP^t - World food price

RY^t – Real GDP supply side

M^2 - Broad Money

FPE^t - Food Price Expectation

3.2 Variable Description

Following the discussion of model specification, this paper try to give brief explanation of the variable entered in the model as follows;

Output: is a key factor for food price inflation because the increase in output leads to excess supply of output in the market as a result the price food item decrease. The expected sign is negative.

Inflation expectation: It considered lagged value of the food price inflation as a proxy for inflation expectation.

Broad money: according to the theory of money it is regarded as the responsible factor for surge of food inflation. The expected sign is positive.

World food price: the paper expects positive relationship between world and domestic food price

3.3 Econometric procedure

3.3.1 Unit Root Test

Stationary stochastic process has received a great deal of attention and scrutiny by time series analysis broadly speaking a stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the disturbance or gap or lag between the two time periods and not the actual time at which the covariance is computed. On the other hand, if a time series is not stationary in the sense that a time series will have a time varying mean or a time varying variance or both (Gujarat, 2003).

Therefore the paper use the unit root test in order to test the stationary or non stationary of time series data. A commonly applied technique to test for existence of a unit root in the data is the Augmented Dickey Fuller (ADF)

Table 2 ADF test for unit roots

Variables	At level		At first difference	
	With constant	With constant and trend	With constant	With constant and trend
LNCPIF	0.311659	-1.592528	-6.689074	-6.595438
LNM2	1.613330	0.667462	-3.958715	-4.324801
LNRY	4.394903	1.447110	-1.950683	-6.746413
LNWFP	-2.091013	-2.517970	-7.586087	-7.569923

The unit root test is applied to all variable in their level and first difference for the data covering 1971-2013.As indicated in the above table the variable in their level are not stationary but the ADF result of the first difference variable supports all the variable with constant and trend are stationary at 5% critical value see the output in annex part.

3.3.2 Co integration Test

Using the stationarity properties of the data series, tests for co-integration of the variables is conducted because co-integration necessitates that all variables of a model must be integrated of the same order. A test for co-integration indicates stable long run relationships among non stationary economic variables. Therefore, co-integration test is designed to check for the existence of co-integrating relationships between non-stationary variables. Just testing the stationarity of the residual term makes the test for the presence of co-integration and then, the method established by Engle Granger co-integration involves examining the stationarity of the residuals from the long-run relationship

Table 3 Engle Granger Residual Test

Variables	At level	
	With constant	With constant and trend
ECM	-6.236691	-6.156144

Thus, the test shows that the unit root test on the retained residuals of the regression is stationary at level. The implication is that all the variables are co-integrated, meaning that there is a long run relationship (equilibrium) that exists between the dependent variable and independent variables and so we can avoid both the spurious and inconsistent regression problems which otherwise would occur with regression of non-stationary data series see the E-views output in the annex part.

3.3.3 Estimation results

Long run model estimation

Based on the time series data, ordinary least square method is applied to test for the long run relationship of food inflation and its determinant.

Dependent Variable: LNCPIF
Method: Least Squares
Date: 07/09/15 Time: 09:42
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNM2	0.303366	0.083546	3.631125	0.0008
LNRY	-0.361203	0.171218	-2.109610	0.0417
LNWFP	0.523632	0.121684	4.303222	0.0001
LNCPIF(-1)	0.572371	0.104840	5.459489	0.0000
C	0.626053	1.359056	0.460653	0.6477

R-squared	0.984002	Mean dependent var	2.751540
Adjusted R-squared	0.982272	S.D. dependent var	0.967415
S.E. of regression	0.128808	Akaike info criterion	-1.149643
Sum squared resid	0.613886	Schwarz criterion	-0.942777
Log likelihood	29.14250	Hannan-Quinn criter.	-1.073818
F-statistic	568.9304	Durbin-Watson stat	1.987637
Prob(F-statistic)	0.000000		

The estimation result reveal all the variables have the expected sign and significant at 5 % level of significance.

The coefficient of the variables indicate that the response of the dependent variables for a percentage change of the explanatory variables for instance a one percent increase in broad money boost the inflation by 3 percent. This implies that the increase in money supply has a greater positive impact on demand than supply.

In addition, a one percent increase in domestic supply leads to 3.6 percent decrease in domestic food price this implies that the excess supply reduces food prices in the domestic market and thus lowers inflation.

The other variable that includes in the long run estimation is world food price; a one percent increase in world food price has a 5 percent positive impact on domestic food price due to the increase in price of imported food item in the domestic market.

The last variable is inflation expectation, a one percent increase in expectation push food price by 5.7 percent this result is similar to the theory of adaptive expectations, they states that individuals will form future expectations based on past events. For example, if inflation was higher in the past, individuals anticipate future inflation to be higher this higher expectation leads to high demand in the future this prompts producers to raise price.

Hence, looking all the coefficient of the explanatory variable in the long run model there is evidence that food inflation in Ethiopia is determined both demand(money supply and expectation) and supply(output and world food price) factor.

The adjusted R- squared

The adjusted coefficient of determination ($R^{2)}$ shows that explanatory variables explained approximately 98% of the variation in food price. This gives the regression line a good fit while the remaining 0.01% of the total variation in the food price is accounted for by the factors included in the error term.

F-TEST

F-test shows that whether the explanatory variable jointly explains the dependant variable or not. It also tests the overall significant of the estimated parameters.

Null hypothesis H_0; all the variable are zero jointly and simultaneously

Alternative hypothesis H_1; all variable are different from zero jointly and simultaneously

- The calculated F (568.9) is greater than the critical value so the paper reject the null hypothesis and accept the alternative hypothesis i.e. all the variable are different from zero and it has a significant impact on the dependent variable.

Diagnostic Check of Long Run Model

The econometric estimation technique that is used by this study is ordinary least square (OLS). There are five assumptions made in relation to the classical linear regression model (CLRM). The researcher has tested the remaining post regression assumption of CLSM it check the violation of these assumptions. The method used to test these assumptions by this research is described as follows:-

Test for Serial Correlation

Null hypothesis: There is no serial correlation

Alternative hypothesis: There is serial correlation

Table 3

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.563619	Prob. F(5,32)	0.1985
Obs*R-squared	8.246503	Prob. Chi-Square(5)	0.1432

Sources: EViews 8 Unit Root Test Output

As shown above table, the residual are tested for correlation and the result shows that there is no correlation. Thus, this paper accepts the null hypothesis and rejects the alternative hypothesis at 5% critical point.

Heterosedacity Test

Null hypothesis: Homoskedasticity

Alternative hypothesis: Heteroskedasticity

Table 4 Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.877662	Prob. F(4,37)	0.1350
Obs*R-squared	7.087005	Prob. Chi-Square(4)	0.1314
Scaled explained SS	5.794940	Prob. Chi-Square(4)	0.2150

Sources: EViews 8 Unit Root Test Output

Breusch-Pagan-Godfrey test was conducted for hetrocedasity and the null hypothesis of homoskedasticity was tested against the alternative hypothesis of heteroskedasticity. The result in table 4 indicates that accept the null hypothesis of homoskedasticity as indicated by the given probability value at 5% critical levels of significance which means variance of the residual no vary with time.

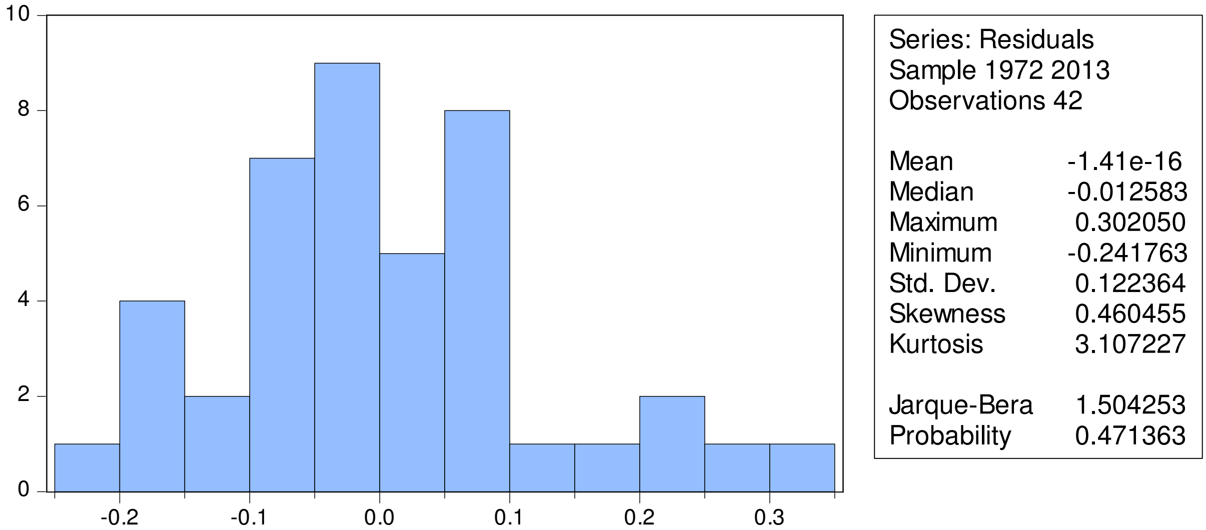
Normality Test of the regression model

Null hypothesis: The residuals are normally distributed

Alternative hypothesis: The residuals are not normally distributed

Below the figure indicates that a Jargue-Bera normality test has been used for normality test. The kurtosis value is around 3.1 which is equal to 3. The p-value given at the bottom of the normality test screen should be bigger than 5 percent. Hence, the p-value shows 0.47 which is greater than 0.05 failed to reject the null hypothesis of normality presence at the 5% level due to this the paper accepts the null hypothesis.

Figure 1 Histogram normality test

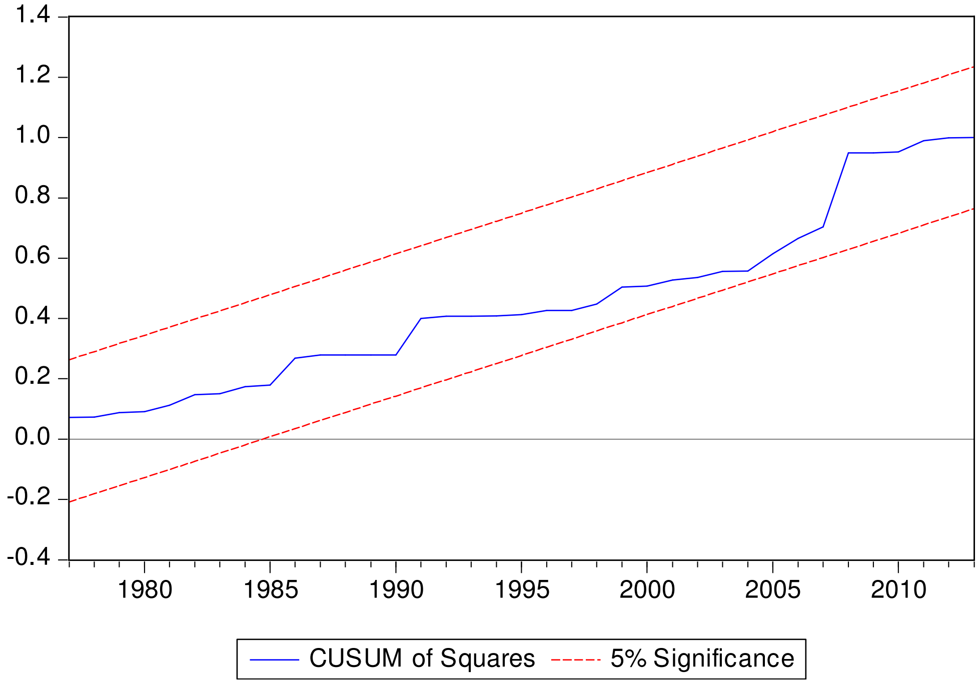


Source: E-Views 8 output for normality test

Stability test

To test consistency of the parameter over time the paper use the CUSUM of squares test which provides a plot of against t and the pair of 5 percent critical lines. As with the CUSUM test, movement outside the critical lines is suggestive of parameter or variance instability. The figure below shows that stability test of the model.

Figure 2 Stability test



From the above figure, the test finds the parameter or variance are stable because the cumulative sum square doesn't goes outside the area between the two critical lines. Therefore the paper concludes that the parameters are not change overtime this implies that forecast or other policy measure are possible based on the above model.

Short Run Dynamics model

Using the unit root test of the error term of the long run estimation, an error correction model (ECM) is build to capture the short run elasticity. The short run dynamics model provides information on how adjustments are taking place among the variables under study.

In the short run dynamic error correction equation, all the variables except money supply are statistically significant at 5% level in the model and they have expected sign.

Short Run Model
Dependent Variable: D(LNCPIF)
Method: Least Squares
Date: 07/09/15 Time: 14:24
Sample (adjusted): 1973 2013
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNM2(-1))	0.327459	0.398160	0.822431	0.4164
D(LNRY)	-0.825299	0.364211	-2.265989	0.0297
D(LNWFP)	0.509584	0.156141	3.263619	0.0025
D(LNCPIF(-1))	0.604882	0.232473	2.601949	0.0135
ECM(-1)	-0.977048	0.286344	-3.412147	0.0016
C	0.013439	0.051834	0.259278	0.7969

R-squared	0.401491	Mean dependent var	0.094973
Adjusted R-squared	0.315990	S.D. dependent var	0.159759
S.E. of regression	0.132129	Akaike info criterion	-1.075624
Sum squared resid	0.611028	Schwarz criterion	-0.824858
Log likelihood	28.05030	Hannan-Quinn criter.	-0.984309
F-statistic	4.695733	Durbin-Watson stat	2.031423
Prob(F-statistic)	0.002194		

In this regard, the finding revealed that the adjustment coefficient for the estimated food price equation is statistically significant at 1% level and negative. It is incredibly fine with about 97 percent convergence of the short-run shock existing last year towards its long-run path in the current year i.e. its power to adjust deviation from equilibrium per annum is just 97 percent and hence for any equilibrium to be corrected it will require at least one year.

V Conclusion and Recommendation

4.1 Conclusion

The general objective of this paper was to quantify the determinants of food inflation in Ethiopia using OLS estimate during 1971-2013.

The empirical analysis evident that the entire variable are consistent with the expected sing and significant at 5% level significance and also the co integration test indicate that there is long run relationship between these variables and food inflation.

Generally, based the empirical result the paper conclude that food inflation in Ethiopia is determined both demand (money supply and expectation) and supply (output and world food price) factor.

The diagnostics test also asserts the long run model pass all major diagnostic checks there which are no evidence of autocorrelation, hetrosckedasticity, normality and stability problem.

In the short run dynamic error correction equation, all the variables except money supply are statistically significant at 5% level in the model and they have expected sign. The finding also revealed that the adjustment coefficient for the estimated food price equation is statistically significant at 1% level and negative. It is incredibly fine with about 97 percent convergence of the short-run shock existing last year towards its long-run path in the current year.

4.2 Recommendation

Based on the analysis, this paper recommended that;

- ❖ The regression analysis showed monetary growth as a significant impact only in the long run so the government uses effective monetary policy for instance improved functioning of the financial sector and a more effective control of money supply to control food inflation.
- ❖ To control food inflation the government should emphasis on enhancing production and supply of food product to offset the increase in demand due to increase in per capital income. To increase the food supply the unutilized resource should be utilized by subsiding and distributing selected seed and fertilizer.

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Annex

Unit root test

Null Hypothesis: LNCPIF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.311659	0.9762
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCPIF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.592528	0.7791
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCPIF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.689074	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCPIF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.595438	0.0000
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNM2 has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.613330	0.9993
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNM2 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.667462	0.9994
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNM2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.958715	0.0038
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNM2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.324801	0.0072
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNRY has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.394903	1.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNRY has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.447110	1.0000
Test critical values:	1% level	-4.205004	
	5% level	-3.526609	
	10% level	-3.194611	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNRY) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.950683	0.3066
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNRY) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.746413	0.0000
Test critical values:	1% level	-4.205004	
	5% level	-3.526609	
	10% level	-3.194611	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNWFP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.091013	0.2492
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNWFP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.517970	0.3184
Test critical values:	1% level	-4.192337	
	5% level	-3.520787	
	10% level	-3.191277	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNWFP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.586087	0.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNWFP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.569923	0.0000
Test critical values:	1% level	-4.205004	
	5% level	-3.526609	
	10% level	-3.194611	

*MacKinnon (1996) one-sided p-values.

Co-integration test
Null Hypothesis: ECM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.236691	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: ECM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.156144	0.0000
Test critical values:	1% level	-4.198503	
	5% level	-3.523623	
	10% level	-3.192902	

*MacKinnon (1996) one-sided p-values.