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REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

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RECOMMENDATIONS/SUGGESTIONS

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- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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VERTICAL PRICE TRANSMISSION BETWEEN CEREALS AND BREAD AND OTHER PREPARED FOODS: DOES PRICE STABILITY IN CEREALS MARKET STABILIZES PRICE OF BREAD AND OTHER PREPARED FOODS?

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ABSTRACT

Nowadays, food inflation is a common phenomenon that Ethiopia is experiencing. The soaring food price is expected to affect food security of especially the majority poor households. Bread and other prepared foods are among the major food items facing this problem for which demand is higher and consumers are much responsive to the price change, as the situation intends to affect the livelihood of the majority of the people. Hence, it seems indispensable to take appropriate measures targeted on the stability of prices of these commodities. Price stability measures, so far, focus on grain market. These measures are expected to be efficient if they are also able to stabilize prices of processed commodities such as bread and other prepared foods. This can be realized if the markets for agricultural commodities are coordinated with that of processed commodities. Hence, the purpose of this paper was to establish the extent to which cereals market is efficiently coordinated with market of bread and other prepared foods, in Addis Ababa. In order to figure out this, secondary data of monthly price series were extracted from the Central Statistical Agency for the period from September, 1996 to April, 2012 (having 188 observations). The data were analyzed using Johansen's and Juselius co-integration test and vector error correction model coupled with other descriptive approaches. The findings of the study reveal that price of cereals and bread and other prepared foods are co-integrated; however, there is an asymmetry in price transmission between the prices of the two categories of commodities implying that policies targeted on the stability of prices of grains such as cereals does not efficiently stabilize prices of processed commodities like bread and other prepared foods. Hence, additional measures are required to bring about stability in price processed commodities.

KEYWORDS

Price stability, Bread and Other Prepared Foods, Cereals, Market Coordination, Price Transmission.

INTRODUCTION

The rising food prices in recent years is a global issue. In Ethiopia, since 2005, the rise in food prices has been tremendous. It has been 15.1% in 2006, 28% in 2007, 57.4% in 2008 and stands at 36.4% in 2009. The non-food price index has also been rising since 2000, but is relatively stable compared to the food price index (FPI). In 2007-2008, the food prices increase in Ethiopia accounted for almost 62% of the total inflation. Generally, the consumer price index (CPI) and FPI are highly correlated with about 57 percent of consumption expenditure spent on food (Jema et al, 2011). In Ethiopia, prices of food items surged by 47.4 percent, while the non-food inflation increased by 27.8 percent in July 2011 as compared to the prices of July 2010. The common feature is that the prices of almost all commodities have risen in the same period. The 47.4 percent increase in food index is due to increases in the prices of Cereals (42.1 percent), Pulses (82.1 percent), Bread and Other Prepared Food (19.5 percent), Meat (32.2 percent), Milk, Cheese and Eggs (36.2 percent), oils and Fats (90.2 percent), Vegetables and fruits (25.3 percent), Spices (45.4 percent), Potatoes, Other Tubers and Stems (44.4 percent), Coffee and Tea Leaves (104.8 percent), Other Food Items (9.5 percent), Milling Charge by (15.8 percent), and Food Taken Away from Home (33.3 percent) (CSA, 2011).

This dramatic increase in food prices and its consequences has remained an issue of policy makers, donor agencies, economists, and the society at large. The traditional economic theory asserts that inflation will have redistributive effect by imposing 'inflation tax' and can hurt particularly the lower income groups and those people whose income is relatively less flexible (Jema et al, 2011). As cited in Jema et al (2011), Zhu (2008) noted that the rising food and energy prices significantly impact people of all countries; however, the social unrest occurring in some developing countries shows that the survival of the local poor is threatened. Food price inflation affects poor people's purchasing power. It has an income effect on household budgets and also increases the risk. Inflation stands as a "Poor Man's Tax". Poor people are disproportionately affected because they spend a larger proportion of their income on food. Rising food prices, thus decrease the real income of the most vulnerable people, with serious nutritional and health consequences.

Analysis of food inflation for different income groups, in South Africa, shows that poor households experienced higher inflation rates than wealthier. At its peak in October 2002, poor households were confronted with year-on-year food inflation of 23.1% , while richer households only experienced food inflation of 19%. The benefit to the poor of the recent lower prices for most staple foods is reflected in a food inflation rate of 3.35% compared to that of richer households of 4.21% (Anonymous, n.d.).

Addis Ababa is one of the most affected regions, in Ethiopia, by the current food price soaring. In Addis Ababa, the food inflation was estimated to be about 19.6% in 2006 and 27% in 2007 which is the highest of all the regions of Ethiopia. In terms of price variability, Addis Ababa was ranked third with price variability rate of 14.9% next to Harari (19.1%) and Gambella (15.9%), in 2008. Due to the price soaring, households in Addis Ababa, Harari and Dire Dawa face relatively higher consumption loss as compared to other regions (Ulimwengu et al, 2009). Consequently,the food security of poor households of the region is expected to be adversely affected (WFP, 2009). In order to ensure the food security, as a response to the rising of food prices, different policies are being recommended. According to Mondiale (2008), policy interventions can be divided into three broad classes: (i) interventions to ensure household food security by strengthening targeted safety nets; (ii) interventions to lower domestic food prices through short-run trade policy measures or administrative action, and (iii) interventions to enhance long-term food supply.

In Ethiopia, in order to mitigate the impact of rising food prices, the Government assistance programs have been expanded to urban areas with an introduction of the urban grain market stabilization program in 2007. The program started initially in Addis Ababa, and then expanded to cover 12 urban centers namely:

Bahar Dar, Gondar, Dessie, Kombolcha, Mekele, Adigrat, Dire Dawa, Harar, Awassa, Nazareth and Jimma, reaching out to a total of over 800,000 households who bought wheat grain at subsidized prices. The Government continued with the program from mid-August 2008 in a different form and sold 150,000 MT of wheat to wholesalers, consumers, millers and traders at *Birr* 3.5 per kg on a first come first served basis, removing the coupons or ration cards system (WFP, 2009).

Such policy intervention directly affects prices of certain types of commodities (i.e. Grains) for a while, and later, may indirectly affect the prices of other commodities (processed), as well, if there is efficient market integration. If there is no or little integration (coordination) in the markets, the reduction in prices of the grains, such as cereals, as the result of the policy interventions, has nothing to do with prices of domestically processed commodities like breads and other prepared foods which are purchased and consumed by a majority of the people; hence, no or few changes are observed on the livelihood of final consumers. Even when the markets are co-integrated but do not show symmetry in price transmission (in such a way that fall in the price of the grains is not reflected in the price of the processed commodities), the problem still persists. A well-functioning input and output markets may assure vertical integration and coordination functions. However, this may not be the case in developing countries like Ethiopia, where market imperfections are usually prevalent.In cognizant of this, this study deals with the extent to which cereals markets are integrated with bread and other prepared food items, in Addis Ababa. Hence, the question we raise here is that whether stability in the prices of cereals can stabilize prices of bread and other prepared foods, in Addis Ababa.

Bread and other prepared foods are expected to be purchased for consumption by a majority of the people, for which, a small change in price can significantly alter the livelihood of the people, especially the poor. Hence, if livelihood of the poor should be improved through pro-poor policies, more emphasis should be given to price stability of such kinds of commodities. Bread and other prepared foods, according to the report of the Central Statistical Agency (2011), include bread, "enjera" – Teff mixed, "dabo – ambasha", "dabo – sheleto", bread - wheat (bakery), biscuits and others. The major inputs for production of these commodities are cereals. Hence, as breads and other prepared foods and cereals markets are expected to be interrelated, policies enacted for stabilizing prices of cereals may intend to be reflected in the prices of bread and other prepared foods. In other words, if there is efficient market integration, prices of bread and other prepared foods can be stabilized through stability of prices in cereals market.

OBJECTIVES OF THE STUDY

The major objective of the study was to establish the extent to which cereals market is efficiently coordinated with market of bread and other prepared food. More specifically ,the study was undertaken;

1. To assess the extent of the short-term and long-term association between the prices of cereals and bread and other prepared foods, in Addis Ababa.
2. To indicate the type of causality existing between prices of these products
3. To examine the efficiency of the market through analysis of symmetry/asymmetry of price transmission between these markets.

METHODOLOGY

This study was conducted making use of secondary data extracted from the Central Statistical Agency. The data are time series having 188 observations of monthly recorded price series of cereals and bread and other prepared foods, in Addis Ababa, for the period from September, 1996 to April, 2012. The data were analyzed using descriptive and quantitative (time series econometric) approaches. The descriptive analysis deals with the comparison of trend of price movements for the two categories of commodities. This involves graphical presentation of the price series and comparison of price variations using the F-statistic and coefficient of variation. With regard to the time series econometric approach, co-integration tests and a Vector Error Correction Model (VECM) were used which intend to show how markets of cereals and bread and other prepared foods are integrated. Generally, the time series econometric approach involves the following steps:

i) Test of stationarity of the two price series using an Augmented Dickey Fuller test
ii) Test of co-integration of the two price series using Johansen and Juselius' (1990) approach
iii) Analysis of the manner of causality between the two price series
iv) Analysis of symmetry/asymmetry of price transmission between the two markets

MODEL SPECIFICATION

TEST OF STETIONARITY (UNIT ROOT)

It is often *expected* that price levels exhibit non-stationary covariance, which may lead to autocorrelation problems in the price response functions. This may result in spurious regression when we estimate the relationship between the price series. Hence, the unit root test was undertaken to know if the monthly market prices are stationary or not, using an Augmented Dickey Fuller test. This is done to pretest each variable and to determine its order of integration (Verbeek, 2004).

If we express the two prices (cereals' price and bread and other prepared foods' price) as an autoregressive process of order one as:

$P_t^C = \alpha + \beta P_{t-1}^C + \varepsilon_t$ and $P_t^B = \rho + \theta P_{t-1}^B + v_t$ ..... (1)

Where

P_t^C is price of cereals

P_t^B is price of bread and other prepared foods

α, β, ρ, and θ are constants

ε_t and v_t are error terms

The Augmented Dickey-Fuller test involves regressing the first difference of these price series on own lagged values and testing for stationary or non-stationarity.

$$\Delta P_t^C = \delta + \gamma P_{t-1}^C + \sum_{t-1}^{t} \Delta P_{t-1}^C + \varepsilon_t$$

$$\Delta P_t^B = \sigma + \phi P_{t-1}^B + \sum_{t-1}^{t} \Delta P_{t-1}^B + v_t$$

Where: $\gamma = \beta - 1$ and $\phi = \theta - 1$ ..... (2)

Based on the above stetionarity test, the following hypotheses were derived as

HO1: Cereals price series have a unit root or are non-stationary

HO2: Bread and other prepared food price series have a unit root or are non-stationary).

If the variables are non-stationary, then the co-integration test will follow.

TEST OF CO-INTEGRATION

In the second step of our econometric approach, we examine the existence of cointegration between the two variables in our VAR system. In simple words, we search for the existence of the number of co-integrated vectors, r, within Johansen and Juselius' (1990) framework. Using their technique, we implement a k-dimensional VAR of the following form:

$$P_t = \mu + \sum_{j=1}^{k} \Pi_i P_{t-1} + e_t. \quad \text{.....(3)}$$

Where P_t is a (2 x 1) vector matrix of the cereals and bread and other prepared foods prices, respectively; and e_t are Gaussian residuals. The VAR in Equation 3 can be re-parameterized into a VECM form as:

$$\Delta P_t = c + \Pi P_{t-1} + \sum_{j=1}^{k-1} B_j \Delta P_{t-j} + \varepsilon_t$$

..... (4)

Where ∏ is a (2x2) matrix of long-run and adjustment parameters, B_j is a (2x2) matrix of the short-run parameters, ε_t is the vector of residuals and j is the number of lags. Following Johansen's procedure, the co-integration relationship between prices was examined under equation 4, where each price is a function of its own lagged values and the lagged values of the other price series. The trace and maximum eigenvalue statistics are used to determine the rank of ∏ and to reach a conclusion on the number of co-integrating equations, r, in our bivariate VAR system.

ANALYSIS OF DIRECTION OF CAUSALITY

In the third stage of our approach, we have to define the direction of causality between the two variables. Therefore, we implement a complete dynamic Granger–Engle VECM test of the following form (as indicated in Reziti and Panagopoulos, 2008):

$$\Delta P_t^B = \mu_1 + \sum_{i=1}^{n1} \beta_b \Delta P_{t-i}^B + \sum_{i=1}^{n2} \beta_c \Delta P_{t-i}^C + \pi_1 Z_{t1-1} + e_{t1} \quad \text{..... (5)}$$

$$\Delta P_t^C = \mu_2 + \sum_{i=1}^{n1} \beta_b \Delta P_{t-i}^B + \sum_{i=1}^{n2} \beta_c \Delta P_{t-i}^C + \pi_2 Z_{t2-1} + e_{t2} \quad \text{..... (5')}$$

Where Z_{t1-1} and $\pi_1 Z_{t2-1}$ are adjustment or error correction terms whereas π_1 and π_2 are their respective coefficients and the β are short-run coefficients.
Hence, the hypotheses derived from the proposed model specifications were:
(a) $\pi_1 \neq 0$ and $\pi_2 \neq 0$ (a feedback long-run relationship between the two variables)
(b) $\pi_1 = 0$ and $\pi_2 \neq 0$ (price of bread and other prepared foods causes the price of cereals in the long-run)
(c) $\pi_1 \neq 0$ and $\pi_2 = 0$ (price of cereals causes the price of bread and other prepared foods in the long-run)
For testing the three alternative options, a weak exogeneity test is implemented according to Johansen's (1992) methodology.

ANALYSIS OF SYMMETRY/ASYMMETRYOF PRICE TRANSMISSION

In this point, we have already adjudicated on the focal point of causality between the examined variables (assume that the cost of cereals causes the cost of sugar and other prepared foods), and we go to the last step of the estimation for the being of a symmetry price transmission in the examined market with the aid of an asymmetric ECM. In general, as indicated in Minot (2011), the Error Correction Model, including many lags, can be presented as shown by equation 5. That is;

$$\Delta P_t^B = \mu + \sum_{i=1}^{n1} \beta_b \Delta P_{t-i}^B + \sum_{i=1}^{n2} \beta_c \Delta P_{t-i}^C + \pi Z_{t-1} + e_t \quad \text{..... (6)}$$

Given the above equation, the procedure of testing for asymmetry price transmission requires the creation of dummy variable from the error correction term, Z_{t-1} for positive and negative adjustments to shocks. Splitting the error correction term into positive and negative components (i.e. positive and negative deviations from the long-term equilibrium as Z_{t-1}^+ and Z_{t-1}^-) makes it possible to test for asymmetric price transmission according to Meyer and Von Cramon –Taubadel, (2004). Hence, the equation of symmetry analysis can be stated as:

$$\Delta P_t^B = \mu + \sum_{i=1}^{n1} \beta_b \Delta P_{t-i}^B + \sum_{i=1}^{n2} \beta_c \Delta P_{t-i}^C + \pi^+ Z_{t-1}^+ + \pi^- Z_{t-1}^- + e_t \quad \text{..... (7)}$$

Where Z_{t-1}^+ measures the movement towards equilibrium by the price of bread and other prepared foods when there is a positive shock to cereals price (or an increase in cereals price) and Z_{t-1}^- measures the movement towards equilibrium by the price of bread and other prepared foods when there is a negative shock to cereals price (or a decrease in cereals price).
The null hypothesis in the test for asymmetry is that the response by price of bread and other prepared foods is the same whether the shock or the deviation is positive or negative in cereals price i.e. the coefficients of Z_{t-1}^+ and Z_{t-1}^- are not statistically different from each other. Symmetric price transmission is rejected if π^+ and π^- are significantly different from one another, which can be evaluated using an F-test. A Joint F-test is used to determine the symmetry or asymmetry of the price transmission process at a 0.05, 0.01 or 0.1 level of significance (Acquah and Onumah, 2010). In general, the test for the null and alternative hypothesis can be written as:

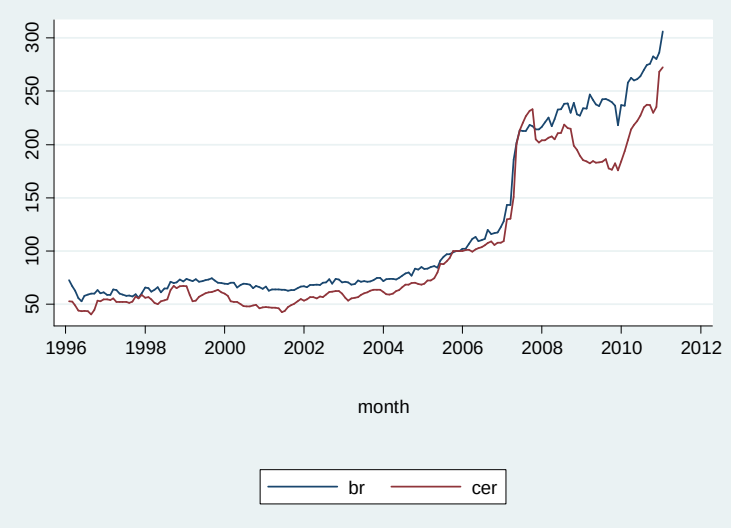
a) Ho: $\pi^+ = \pi^-$ (i.e. price transmission is symmetric)
b) Ha: $\pi^+ \neq \pi^-$ (i.e. price transmission is asymmetric)

RESULTS AND DISCUSSION

DESCRIPTIVE ANALYSIS

As an insight to our point of interest, this descriptive analysis tries to show how the prices of bread and other prepared foods and cereals are associated using visual presentation. In addition, in this section, comparative analysis of variation of the two price series is reported. The trends of prices of cereals and bread and other prepared foods is presented using figure 1. Generally, the visual presentation of figure 1 indicates that there is a strong association between the prices of bread and other prepared foods and cereals, for the period between 1996 and 2012. As indicated by the figure, the price series shows an almost similar trend of movements.

FIGURE 1: TRENDS OF PRICE OF CEREALS AND PRICE OF BREAD AND OTHER PREPARD FOODS



However, the figure indicates that the price of bread and other prepared foods relatively shows smother trend of continuous rise, whereas the price of cereals has relatively more ups and downs. It is common to see seasonal increase and fall of agricultural products. As cereals are primary products of the agricultural sector, we usually observe fall in their price during the wet season (when the weather condition is favorable); and a rise in their price during dry season (when the weather condition is unfavorable). But this may not be the case for processed products like bread and other prepared foods.

The figure shows that for a rise in the price of cereals, the price of bread and other prepared foods also rises almost in all cases. But this is not necessarily true when the price of cereals falls. For instance, for the period between 2000 and 2002, the price of cereals shows a slight decrease where; at the same period, the price of bread and other prepared foods does not show any tendency to fall. Between 2002 and 2008 when the price of cereals rises continuously, so does the price of bread and other prepared foods. Between 2008 and 2010, by the time the government provides subsidies of provision of grains with lower price for households in Addis Ababa, the price of cereals has shown a significant fall; but at the same period, the price of bread and other prepared foods does not show such a fall. This may somehow diagnose the presence of asymmetry in price transmission.

As additional information, comparative analysis of the overall trends of the variation in the two price series was made using the F-statistics and Coefficient of variation. The estimation result of the F-statistics and Coefficient of variations is presented using table 1. Table 1 shows that the standard deviations of price of bread and other prepared foods and that of cereals are 74.12 and 65.65 whereas standard errors of the two price series are 5.41 and 4.79, respectively. As indicated in the table, the value of the F-statistic is 1.2748 which is greater than the tabulated value (1.26), implying that we should reject the null hypothesis that the extents of variations of the two price series are the same, at the 5 % level of significance.

TABLE 1: VARIANCE RATIO TEST AND COEFFICIENT OF VARIATION OF THE TWO PRICE SERIES

Variables	Observations	Standard Error	Standard Deviation
Price of bread and other prepared foods	188	5.405939	74.1225
Price of cereals	188	4.787927	65.64874
Combined	376	3.631327	70.41405
f = 1.2748 CV_{br} = 0.63 Degree of freedom = 187, 187 CV_{cer} = 0.65			

Source: own computation, 2014

As indicate in the table the coefficients of variation of the two price series are 0.65 and 0.63 for cereals and bread and other prepared foods, respectively. This indicates that, given the difference in the variations in the two price series as shown by the F-statistics, the value of the coefficients of variation show that the price of cereals is relatively highly variable than that of bread and other prepared foods. This may imply that price of bread and other prepared foods changes (show variation) mostly for upward movements in the price of cereals; and it seems to remain unchanged (or shows little change) for downward movements in the price of cereals. This may also be another sign of the presence of asymmetry in price transmission. Whatever the case may be, in order to be sure, this will be dealt briefly using our quantitative analysis, in the following session.

TIME SERIES ECONOMETRIC ANALYSIS

As suggested in the methodology section, the following tests includes four major steps such as test of stationarity, test of co-integration, test of direction of causality and test of symmetry/asymmetry of transmission between the two price series.

TEST OF STATIONARITY (UNIT ROOT TEST)

Here, the study was carried out to recognize whether the stated variables have unit roots or not and to find out their co-integration. In this case ,price of bread and other prepared foods was found to be stationary in level (see Table 2). On the other hand,even if the price of cereals was found to be non-stationary in level, it was found that stationary in the first difference. MacKinnon approximates p-values of Z (t) of the price of bread and other prepared foods and price of cereals are 0.9982 and 0.9849, respectively.

TABLE 2: AUGMENTED DICKEY FULLER TEST FOR UNIT ROOT OF PRICES OF BREAD AND OTHER PREPARD FOODS AND CEREALS

Commodities	Bread and other prepared foods	Cereals
Intercept	-0.0610553 (0.7533127)	0.390208 (0.8107799)
Price in level	0.010097* (0.0057866)	0.0035443 (0.007087)
P-value	0.083	0.618
L	3	4
First diff of price	0.0111053 (0.0774733)	0.3459581*** (0.0758849)
P-value	0.886	0.000
MacKinnon approximate p-value for Z(t)	0.9982	0.9849

Source: Own computation, 2014

The respective P-values of the prices in level are 0.083 and 0.618, respectively. This shows that price of bread is stationary in level, at the 10 % level of significance, whereas the price of cereals is non-stationary in level. The P - value of the lagged prices of cereals was found to be 0.000 implying that it is integrated of order one, at the 1 % level of significance. The overall implication of the stationarity test is that there is the possibility of a long - run relationship (co-integration) between the two price series, in their first difference.

TEST OF CO-INTEGRATION BETWEEN THE TWO PRICE SERIES

So as to test for co-integration, the study must first specify how many lags to include. According to Nielsen, (2001) the methods implemented in lag-order selection statistics for VARs and VECMs can be used to determine the lag order for integration. Consequently, the lag-order selection statistics (*LR, FPE,* AIC, HQIC and SBIC) were computed. All these statistics show the same result that four lags should be used in the estimation of the co-integration equation (see appendix 3).

Once the number of lags has been determined, the Johansen and Juselius' (1990) framework was implemented to determine the number of co-integrating equations. The estimation result is presented in table 3. This estimation was carried out to determine the rank of the co-integration matrix. As indicated in the table, we reject the hypothesis that there is no integration between the price of bread and other prepared foods and price of cereals (i.e. r = 0). Because both the trace and the max statistics are greater than their respective 5% critical values when r = 0. That is, 27.9555 > 15.41 and 25.4321> 14.07. But, we don't have any evidence to reject the hypothesis that the number of co-integrating equations are not more than one since both the statistical values are less than their respective 5% critical values when $r \leq 1$ (i.e. 2.5235< 3.76 for both). Hence, we can ensure that there is one co-integrating equation between the two price series.

TABLE 3: RESULT OF JOHANSEN' TESTS FOR CO-INTEGRATION OF THE PRICE SERIES

Rank	Eigenvalue	Trace		Max	
		Statistics	5% critical value	Statistics	5% critical value
r = 0	------	27.9555	15.41	25.4321	14.07
$r \leq 1$	0.12909	2.5235*	3.76	2.5235*	3.76
$r \leq 2$	0.01362	----------	---------	--------	--------
Number of obs = 184 Lags = 4					

Source: own computation, 2014

ANALYSIS OF THE DIRECTION OF CAUSALITY BETWEEN THE TWO PRICE SERIES

Regarding to the direction of causality , the finding ascertains that there is co-integration between the price of cereals and the Price of bread and other prepared foods. The test was analyzed using Engel Granger - Vector Error Correction Model to identify which price causes the other (see Table 4). We can see also that the coefficients of the adjustment parameters have the correct signs implying that there is a rapid adjustment towards equilibrium. The negative sign of coefficient of the adjustment parameter for bread and other prepared foods indicates, when price of bread and other prepared foods is higher or far away from the equilibrium, it has to fall towards the equilibrium over time. On the other hand, the positive sign of coefficient of the adjustment parameter for price of cereals shows that when the price of bread is higher, price of cereals should also increase in order to keep the equilibrium.

Table 4 shows that, in our estimation of the VECM, there are two types of parameters of interest; including the adjustment and the short-run coefficients. The adjustment parameter on price of bread and other prepared foods (i.e. $adjustment_b$) has a coefficient of -0.0536712 and P-value of 0.047 implying that it is significant at 5% level of significance. Similarly, the adjustment parameter on price of cereals (i.e. $adjustment_c$) has coefficient of 0.0800781 and P-value of 0.004, implying that it is significant at the 1% level of significance. This indicates that we have two directions of causality. In other words, price of cereals causes the price of bread and other prepared foods at 5% level of significance; and price of bread and other prepared foods causes the price of cereals at 1% level of significance.

TABLE 4: RESULT OF ESTIMASSION OF VECM

Dependent variables	Independent variables	Coefficient	Standard error	P-value
ΔPbread	$adjustment_b$	-.0536712	.0270183	0.047
	$\Delta Pbead_{t-1}$	-.0555175	.0868105	0.522
	$\Delta Pbread_{t-2}$	.0324904	.0959266	0.735
	$\Delta Pbread_{t-3}$	-.1053331	.0969207	0.277
	$\Delta Pcereal_{t-1}$	.1685079	.0832081	0.043
	$\Delta Pcereal_{t-2}$	.1655613	.0938607	0.078
	$\Delta Pcereal_{t-3}$	-.0647687	.0800592	0.419
	$Constant_b$	.8899076	.4237824	0.036
ΔPcereal	$adjustment_c$	.0800781	.0275673	0.004
	$\Delta Pbead_{t-1}$	.430545	.0885747	0.000
	$\Delta Pbread_{t-2}$	.1779711	.0978761	0.069
	$\Delta Pbread_{t-3}$	.1232005	.0988904	0.213
	$\Delta Pcereal_{t-1}$	.1634589	.0848991	0.054
	$\Delta Pcereal_{t-2}$	-.0821261	.0957682	0.391
	$\Delta Pcereal_{t-3}$	.1382783	.0816863	0.090
	$Constant_c$	.5964483	.4323947	0.168
No. of obs = 184 R-sq chi2 P>chi2 Pbread 0.1780 38.12231 0.0000 Pcereal 0.3276 85.75719 0.0000				

Source: own computation, 2014

Estimates of the short-run parameters also witness the direction of causality. In this regard, as indicated in table 4, the first and the second lag differences of price of cereals ($\Delta Pcereal_{t-1}$ $\Delta Pcereal_{t-2}$) on price of bread and other prepared foods, have coefficients of 0.1685079 and 0.1655613 with P-values of 0.043 and 0.078, respectively. This shows that short-run effects of change in price of cereals on price of bread and other prepared foods are significant, at 5% and 10% levels of significance. Similarly, coefficients of the first and the second lag differences of price of bread and other prepared foods are 0.430545 and 0.1779711 with P-values of 0.000 and 0.069; implying that they are significant at 1% and 5% level of significance.

According to the result, comparatively, the significance of both coefficients of the adjustment parameters and the short-run parameters indicates that, relatively, price of bread and other prepared foods affects the price of cereals at a higher rate than that of the effect of price of cereals on price of bread and other prepared foods. This implies that sellers of cereals are relatively much responsive for the change in price of processers' products (bread and other prepared foods) than the responsiveness of the processors for the change in the price of cereals. In other words, the market is relatively, much led by processers of bread and other prepared foods than sellers of cereals. This has its own implication on symmetry/asymmetry of price transmission or efficiency of the market. This is dealt in brief in the next section.

ANALYSIS OF SYMMETRY/ASYMMETRY OF PRICE TRANISMISSION BETWEEN THE TWO PRICES

This part deals with analysis of efficiency of the market in terms of symmetry/asymmetry of price transmission between the two categories of products. This analysis was undertaken in such a way that adjustment parameters of our estimation result of the VECM were decomposed into positive and negative adjustments; thereby test of equality of variation of the adjustment parameters was carried out using F-statistic.

In the preceding sessions, it was indicated that there are two ways of directional of causality between the two price series. Accordingly, adjustment parameter of each case was decomposed to make the test of the F-statistic. Table 5 shows the estimation result of the variance ratio test of positive and negative adjustments for bread and other prepared foods. This shows the long-run effect of change in the price of cereals on the price of bread and other prepared foods, when price of cereals causes price of bread and other prepared foods.

In this case, existence of symmetry price transmission refers to the situation that the magnitude of the effect of increase in the price of cereals (on the price of bread and other prepared foods) is equal to that of the fall in price of cereals. If this happens, the market is said to be efficient. But, in most developing countries, where market infrastructures are not well developed, this situation hardly exists. Rather, it is expected that sellers of the final product (bread and other prepared foods) are more responsive to the increase in price of major inputs (cereals) than the fall in price of cereals. This is what we meant by asymmetric price transmission. The empirical result of this analysis also reveals that there exists asymmetry in price transmission between the two price series, as shown in table 5.

TABLE 5: VARIANCE RATIO TEST OF POSITIVE AND NEGATIVE ADJUSTMENTS FOR BREAD AND OTHER PREPARED FOODS

Variables	Observations	Standard Error	Standard Deviation
Positive adjustments	155	0.1487147	1.851483
Negative adjustments	29	0.1471106	0.7922149
Combined	184	0.1453679	1.971866
F = 5.4620CVp = 1.05 Degree of freedom = 145, 28 CVn = 0.95			

Source: own computation, 2014

Table 5 presents estimation result of the test of symmetry/asymmetric price transmission. In the table, it is shown that standard deviation and standard errors of the positive adjustments are 1.851483 and 0.1487147, respectively, with 155 observations; whereas that of the negative adjustments are 0.7922149 and 0.1471106, respectively, having 29 observations. The hypothesis to the test of the F-statistic is that the ratio of the two standard deviations is equal to one, given their respective number of observations. The result of the estimation of the F-statistic was found to be 5.4620. This result of the F-statistic is much higher than that of the value (i.e. F = 2.17) above which we reject the null hypothesis at the 1% level of significance. Therefore, we reject the null hypothesis that the ratio of the standard deviations is unitary; implying that there is an asymmetric price transmission.

In this case, the result shows that, coefficients of variation of positive adjustment (CVp) and negative adjustment (CVn) are 1.05 and 0.95, respectively; where the variation of positive adjustment is higher than that of negative adjustment. The implication is that producers of bread and other prepared foods are much responsive and reactive to increase in price of cereals (inputs) than the fall in price of cereals. This indicates that the market of cereals and bread and other prepared foods (between sellers of cereals and processers) is inefficiently integrated.

The other case is when the price of bread and other prepared foods causes the price of cereals. Table 6 indicates a variance ratio test of positive and negative adjustments for cereals. This shows the effect of change in the price of bread and other prepared foods on price of cereals. As indicated in the table, standard deviation and standard errors of the positive adjustments are 3.296223 and 0.2868993, respectively, with 132 observations; whereas that of the negative adjustments is 2.032846 and 0.281905, respectively, having 52 observations. In this case, the result of estimation of the F-statistic was found to be 2.6292. This result of the F-statistic is higher than that of the value (i.e. F = 1.73) above which we reject the null hypothesis at the 1% level of significance. Therefore, we again reject the null hypothesis that the ratio of the standard deviations is unitary; implying that there is an asymmetric price transmission.

TABLE 6: VARIANCE RATIO TEST OF POSITIVE AND NEGATIVE ADJUSTMENTS FOR CEREALS

Variables	Observations	Standard Error	Standard Deviation
Positive adjustments	132	0.2868993	3.296223
Negative adjustments	52	0.281905	2.032846
Combined	184	0.2545031	3.452248
F = 2.6292 Degree of freedom = 131, 51		CVp = 1.42 CVn = 1.35	

Source: own computation, 2014

As indicated in table 6, coefficient of variation for positive adjustments (i.e. 1.42) is higher than that of the negative adjustments (i.e. 1.35). This also reveals that sellers of cereals are much responsive to an increase in the price of bread and other prepared foods than a decrease in the price of bread and other prepared foods. Therefore, in both cases, the findings of this investigation shows that the market between cereals and bread and other prepared foods is not efficiently integrated; implying that price stability in the cereals market may not have anything to do with the price of bread and other prepared foods.

CONCLUSION

In Ethiopia, recent statistical reports show that higher rate of food inflation is a common phenomenon which intends to adversely affect the livelihood of especially the majority poor group. Bread and other prepared foods are among the commodities experiencing the continuous rise of prices even if the magnitude is relatively lower compared to other commodities. As bread and other prepared foods are expected to be purchased by a majority of the people, instability or a continuous rise of their prices can significantly affect the living conditions of specially the poor households.

In cognizant of the adverse impact of the food inflation on the livelihood of especially the poor, the government is taking different measures. These measures usually focus on stability of prices of grains (such as cereals). If there is efficient market co-ordination, price stability in the grains/cereals market is expected to stabilize prices of processed products such as bread and other prepared foods. Taking this into consideration, this study was undertaken to figure out whether the market for cereals and bread and other prepared foods are efficiently coordinated there by price stability in cereals market can also stabilize prices of bread and other prepared foods, in Addis Ababa. To this end, both descriptive and time series quantitative analyses were carried out.

The Result of the descriptive analysis shows that price series of these commodities is moving together showing the possibility of co-integration between prices of these two categories of commodities, as indicated by the graphical presentation. However, the graphical presentation also indicates that there seems to be a great association between prices of these commodities for the rising segment of price of cereals than that of the fall in the price of cereals. Test of equality of variation between the two price series, using F-statistic and coefficients of variation, also indicates that the variation in the price of cereals is significantly higher than that in the price of bread and other prepared foods. Given this, we may suspect that much of the variation in the price of bread and other prepared foods are brought about for the rising segment of price of cereals than for the fall in prices of cereals.

In order to confirm this precisely, time series quantitative analysis was undertaken using a test of co-integration and VECM. The result of the quantitative analysis shows that there is co-integration between the two price series, as indicated by Johansen's and Juselius test of co-integration. Given this, the VECM indicates that there is a simultaneous causality between the two prices, implying that price of cereals cause price of bread and other prepared foods as well as the price of bread and other prepared foods causes the price of cereals.

Taking this into consideration, test of symmetry/asymmetry price transmission was carried out in both cases (when the price of cereal cause prices of bread and other prepared foods, and when the price of bread and other prepared foods causes the price of cereals) decomposing adjustment parameters of our VECM

into positive and negative. Result of test of the F-statistic and coefficients of variation, for both cases, reveals that there is asymmetric price transmission between the two categories of commodities. In other words, the quantitative analysis confirms that markets of the two categories of commodities are not efficiently coordinated.

The implication of this study is that processors of bread and other prepared foods much react to a rise in the price of cereals than for a fall in the price of cereals, in Addis Ababa. The same holds true for sellers of cereals for the change in the price of bread and other prepared foods. Therefore, we can conclude that efforts which are being made to stabilize price grains in general and prices of cereals in particular may not stabilize prices of processed commodities such as bread and other prepared foods. In fact, it is common to observe the continuous rise in price of processed commodities even when there is a seasonal fall in price of agricultural products; due to the absence of efficient vertical coordination in the market. Thus, price stability measures targeted on certain types of commodities should accompany with mechanisms to coordinate the markets if there should be stability in the prices of all food items.

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APPENDICES

Appendix 1: Estimation result of the test for determination of number of lags for bread and other prepared foods before the test of stationarity

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Selection-order criteria
Sample:  5 - 188                        Number of obs     =       184
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1053.79				5581.65	11.4651	11.4722	11.4826
1	-571.901	963.78	1	0.000	29.9696	6.23806	6.25222	6.273*
2	-571.899	.00495	1	0.944	30.2964	6.2489	6.27015	6.30132
3	-567.966	7.8662*	1	0.005	29.3458*	6.21702*	6.24535*	6.28691
4	-567.945	.04102	1	0.839	29.6601	6.22767	6.26308	6.31503

APPENDIX 2: ESTIMATION RESULT OF THE TEST FOR DETERMINATION OF NUMBER OF LAGS FOR PRICE OF CEREALS BEFORE THE TEST OF STATIONARITY

```
. varsoc cer

Selection-order criteria
Sample:  5 - 188                        Number of obs     =       184
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1031.25				4368.93	11.2202	11.2272	11.2376
1	-597.432	867.64	1	0.000	39.5547	6.51556	6.52973	6.55051
2	-586.205	22.454	1	0.000	35.3934	6.4044	6.42565*	6.45682*
3	-586.146	.11763	1	0.732	35.7575	6.41463	6.44296	6.48452
4	-583.612	5.0681*	1	0.024	35.1664*	6.39796*	6.43337	6.48532

APPENDIX 3: ESTIMATION RESULT OF THE TEST FOR DETERMINATION OF NUMBER OF LAGS BEFORE THE CO-INTEGRATION TEST BETWEEN THE PRICE SERIES

```
. varsoc br cer

Selection-order criteria
Sample:  5 - 188                        Number of obs     =       184
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1765.77				758489	19.2148	19.229	19.2498
1	-1141.96	1247.6	4	0.000	899.692	12.4778	12.5203	12.5826
2	-1107.39	69.127	4	0.000	645.394	12.1456	12.2164*	12.3203*
3	-1105.14	4.5017	4	0.342	657.812	12.1646	12.2637	12.4092
4	-1095.68	18.92*	4	0.001	619.958*	12.1052*	12.2327	12.4198

APPENDIX 4: ESTIMATION RESULT OF TEST OF STABILITY OF THE VECM USING EIGENVALUE STABILITY CONDITION (IN TABULAR PRESENTATION)

```
. vecstable, graph

Eigenvalue stability condition
```

Eigenvalue	Modulus
1	1
.8723794	.872379
.68167	.68167
-.1871302 + .5108432*i*	.544039
-.1871302 - .5108432*i*	.544039
-.4429789	.442979
.1080103 + .2698145*i*	.290631
.1080103 - .2698145*i*	.290631

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The VECM specification imposes a unit modulus.
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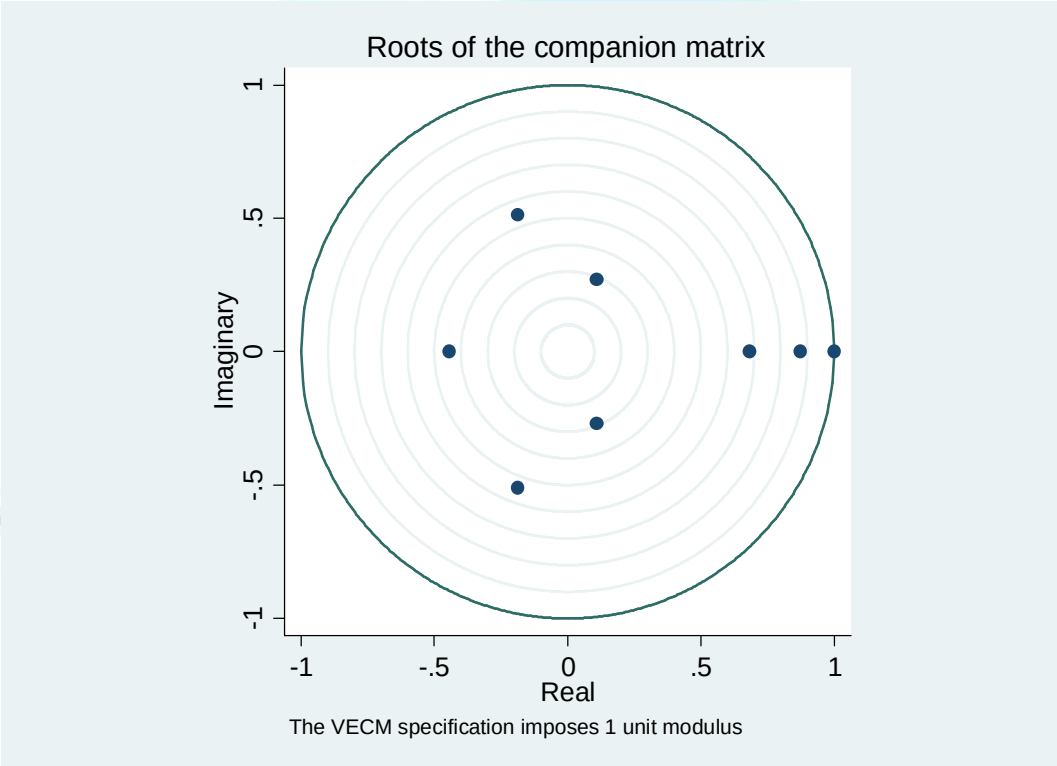
APPENDIX 5: TEST OF STABILITY OF THE VECM IN GRAPHICAL PRESENTATION



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