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The Price Linkages Between Domestic and World Cotton Market

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Abstract: In this paper, Error Correction Model and Engle-Granger Method were used to investigate the price linkages between domestic and world cotton market. The variables of the study are domestic and world cotton monthly prices. The data were collected for period of 2006-2010. According to the results, there is no two-way causality between these two prices. It just shows that world cotton price precedes and causes domestic cotton price. Furthermore, the results show that any price shock induced by world market causes the domestic cotton price to get out of equilibrium and it takes more than approximately three months to eliminate the disequilibrium. According to the findings, support policies in the field of cotton trade are most significant. Import quota equal to difference between domestic industries consumption and domestic production, seems effective to reduce price fluctuations.

Key words: Cotton · Price Linkages · Error Correction Model

INTRODUCTION

Cotton is one of the major agricultural, industrial and commercial products in the world and it is the most valuable natural fibers. It is also the valuable source of fiber and food for humans and livestock. Due to high value added and employment that provides during the production process at the farm, replacement stages in related industries and trade distribution, it plays an important role in economic development of the countries. The products of cotton are more than 30 types that are used in thread, textile, oilseed processing, cellulose and chemical industries. In the other words, cotton products as raw and intermediate materials can solve many problems related to preparation of raw materials by respective manufacturers. So the use of these products in the industries as one of the key drivers of the industries of our country can be emphasized. But in recent years, low amount of acreage and domestic cotton production and effective demand of textile industries because of concerns in the lack of domestic cotton production has been led to increased cotton imports from the other countries. Therefore, cotton price fluctuation following the market-base mechanism, in addition to the profiteering activity of some market intermediaries, is also affected by world process and prices. In this regard, sometimes fluctuations in the domestic cotton price are more than world price changes (increase or decrease). It has caused that the raw material for textile industry provide and supply in an expensive price more than world rate or the raw material demands by industries in a rate less than price of the product. Investigating the presence or absence of relationship and solutions in this field is under the necessity of reducing the adverse effects of world price fluctuations in domestic cotton market.

In recent years, empirical analyses of between world and domestic price for agricultural products have attracted attentions among economists. Moghaddasi *et al.* [1] applied new time series econometric methods to investigate the law of one price in Iran agricultural products market by using price data of three agricultural products including barley, rice and cotton for 1991-2008 period. The results indicated that there were long-run relationship between domestic and world prices of barley and rice. However, no relationship was found in the case of cotton. Robles [2] in "Price transmission from international agricultural commodity markets to domestic food prices: Case studies in Asia and Latin America" analyzed the price transmission effects from international markets to domestic markets in a number of case studies

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in Asia and Latin-America by using Moving Average estimation method. It found positive transmission effects in the case of wheat in Latin American countries and in two out of three Asian countries. There was also evidence of positive transmission effects in the case of rice for most Latin American and all Asian countries part of that analysis. Farajzadeh and Esmaeli [3] in Analyzing Price Transmission in Pistachio World Market Iran investigated the price transmission pattern between domestic and world markets of pistachio. Examination of causality between domestic and world prices showed a long run reciprocal relation between them. Analyses based on the times series data showed a long run symmetric price transmission in both of domestic and world markets. However, price transmission pattern was found asymmetric in short run, showing a more rapid and perfect transmission of price decrease as compared to price increase. Estimation of price transmissions showed that domestic market response to world prices is more considerable than world market prices to domestic ones. In the other research, Imai *et al*. [4] examined the extent to which changes in global agricultural commodity price are transmitted to domestic prices in India and China. The focus was on short and medium-run adjustment processes using an error correction specification. In particular, they showed that the extent of adjustment in the short and medium- run (from 0 to 3 years) was generally larger in China than in India. Second, the adjustment was larger for wheat, maize and rice than for fruits and vegetables in both India and China. In fact, the adjustment is the weakest for vegetables in both countries. Third, while most of the domestic commodity prices co-move with global prices, the transmission is incomplete presumably because of distortions government intervention. Bakhshude [5] investigated world price transmission of selected agricultural products including bovine, ovine, chicken meats, pulses, rice, wheat and tea to their domestic markets by applying ARDL models to time series of 1961-2004. For the purpose of the study, Armington and currency elasticity were calculated for these products. Based on the results, the domestic production and imports of products such as bovine, chicken meat and wheat were substitute whilst the imported tea and pulses were realized to be complements for their corresponding domestic productions from Iranian consumers' point of views. In other words, policies that result in increasing import prices of bovine, chicken meat for instance, relative to their domestic prices would end up to higher imports.

According to the cases above, the present study has been made to evaluate the effectiveness of domestic cotton prices from its global prices. Thus, according to the share of countries in Iran cotton import such as Tajikistan, Uzbekistan, Turkmenistan and Kazakhstan, CIS (Commonwealth of Independent States) cotton prices have been used as world prices for this research subject.

Data and Methods: The time series properties (i.e. the degree of integration, I(d)) of all the variables will be examined by the two commonly used methods i.e. Augmented Dickey-Fuller (ADF) and the Phillips and Perron (PP) tests. If the variables are stationary in levels, i.e. I(0), ordinary least square (OLS) method can be used to estimate the parameters of equation (1). If all the variables are I(1), then the co-integration approach is appropriate to examine the long-run relationship between the variables. It can be done by applying the co-integration tests such as the Engle-Granger two-step method (1987, Econometrica). It can be used to test the presence of potential co-integrating vectors among the non-stationary series in a model. In the first step we estimate the long-run (equilibrium) equation:

$$\text{Log DP} = C_0 + C_1 \text{ Log WP} + U_t \quad (1)$$

In equation (1) DP is the domestic cotton Price and WP is the world (CIS) cotton price. All the variables meant for the estimation regressions are expressed in natural logarithmic terms to stabilize variances.

OLS residuals from (1) are a measure of disequilibrium. A test of co-integration is a test of whether U_t is stationary or not. This is determined by ADF tests on the residuals called Augmented Engle-Granger.

If Ldp variable is found to be co-integrated with its determinants, an Error Correction Model (ECM) is applicable in order to capture both long-run relation via the speed of adjustment and the short-run dynamics of the Ldp model [6]. More precisely, the ECM consists of two components - the error-correction term(s) (ECTs) to capture the speed of adjustment towards long run deviation from the equilibrium linkage between Ldp and its determinants and the second component consists of a set of dynamics variables (variables in first-differenced) as shown in equation (3).

$$\text{ECM} = \text{Log DP} - \hat{C}_1 \text{Log WP} \quad (2)$$

$$\Delta\text{Log DP} = \delta_0 + \sum_{k=1}^{\rho} \delta_{1k} \Delta\text{Log DP}_{t-k} + \sum_{k=0}^{\rho} \delta_{2k} \Delta\text{Log WP}_{t-k} + \delta_3 \text{ECM}_{t-1} + \varepsilon_t \quad (3)$$

In the equation (3); ECM, Δ and ρ denote error-correction term, difference factor and lag- length, respectively.

The significance of the estimated coefficient of the ECT term, δ_3, reflects a long-run causality from the independent variable (lwp) to ldp and it also measures how quickly the ldp adjusts to disequilibrium in a single period. The speed of adjustment of ldp to restore long-run equilibrium after some short-run changes in regressors is equal to one divided by the estimated δ_3.

According to the Iran cotton import trend and the share of the CIS countries as the main cotton import partners of Iran, in this paper, Iran and CIS cotton price data on monthly basis from 2006 to 2010 and Eviews7.1 software are used.

RESULTS

Unit Root Test (Stationary Test): Since the domestic and world price series shows an increasing trend, we tested the ADF test on the trend and intercept. The ADF critical value for unit root at the 1% level of significance is - 4.14. From Table 1 it can be deduced that these two main variables are non-stationary and each contain at least one unit root. Based on the ADF test, the first difference variables are stationary, which implies that variables Ldp and Lwp are integrated of order one, I(1).

Granger Causality Test: The Granger causality test is applied to examine causality between domestic cotton price and world cotton price. Thus, the results of Granger Causality are represented in Table 2. The values of F statistic suggest that lwp Granger-causes ldp and ldp does not cause lwp. Thus, it can be argued that past values of world cotton price contribute to the prediction of the present value of domestic cotton price.

Co-Integration Test and Error Correction Model: Now we can test for the existence of a long-run relationship between the variables, that is, co-integration. In according to stationary and EG causality test results for investigating long-run relationship between Ldp and Lwp, the Engle-Granger two-step estimation procedure is applied. In the first stage, the static equation (without lag) is estimated by using Fully Modified Ordinary Least Squares Method (Table 3).

Then, we used Engle-Granger co-integration test to investigate the existence of the long run relationship between world and domestic cotton prices. Table 4 presents the Engle-Granger tau-statistic and normalized autocorrelation coefficient (z-statistic) for residuals obtained from co-integration regression (Table 3). Z-statistic rejects the null hypothesis of no co-integration with the residual at the 10% level of significant.

Table 1: ADF Unit Root Test Results

		Test Statistic		
Variable	Test Type	Variables in level	Variables in first differences	Stationary Degree
Ldp	ADF (Trend & Intercept) Schwarz Info Criterion	0.630	- 5.54	I(1)
Lwp		-0.557	- 7.987	I(1)

Note: Test critical value in 1% level: -4.14

Table 2: Granger Causality Results

Null Hypothesis	-Statistics F	Prob	Result
LWP LDP does not Granger Cause	0.98	0.38	Null Hypothesis is Accepted
LWP does not Granger Cause LDP	3.52	0.04	Null Hypothesis is Rejected

Table 3: Estimation Result: Fully Modified Ordinary Least Squares Method

Dependent Variable: LDP

Main Variable	Coefficients	Std. Error	t-Statistics
LWP	0.8	0.07	***11.75
C	1.9	0.66	***2.89
R^2	0.83	D.W.	0.62

***, ** and *: Denote significant at 1, 5 and 10% respectively

Table 4: Engle -Granger Co-integration Results

Null hypothesis: Series are not co-integrated (LDP و LWP)	Statistic value	Prob	Result
Engle-Granger tau-statistic	-2.95	0.14	Null Hypothesis is Accepted
Engle-Granger z-statistic	-15.6	0.09	Null Hypothesis is Rejected, Hardly.

Table 5: Stationary Test on Co-integration Model Residuals

Variable	Test Type	t-Statistics	Stationary Degree
Co-integration Model Residuals (Table 2)	ADF (Intercept)	*-2.90	I(0)

***, ** and *: Denote significant at 1, 5 and 10% respectively.

Table 6: Estimation Results: Error Correction Model and OLS Method

Dependent Variable: DLDP			
Variable	Coefficient	Std. Error	t-Statistics
C	0.008	0.008	0.99
DLDP(-1)	0.13	0.17	0.76
DLWP	0.48	0.12	***3.88
DLWP(-1)	-0.12	0.15	-0.85
ECM(-1)	-0.32	0.12	***-2.73
R^2	0.31	D.W.	1.77

***, ** and *: Denote significant at 1, 5 and 10% respectively.

Table 7: Estimation Results: Error Correction Model and Stepwise Method

Dependent Variable: DLDP			
Variable	Coefficient	Std. Error	t-Statistics
DLWP	0.54	0.12	***4.64
ECM(-1)	-0.30	0.11	***-2.79
R^2	0.29	D.W.	1.52

***, ** and *: Denote significant at 1, 5 and 10% respectively

For comparison purposes, is to conduct DF and ADF test on the residuals to check that they are stationary. These results suggest that the residuals are stationary at the 10% level of significant and the domestic and world prices series are co-integrated. These test results are found to be consistent with the z-statistics test result. So there is a weak long-run relationship between these variables (Table 5).

In the next step, the error correction model (ECM) for the co-integrated series is specified. From the Table 6 (before removing insignificant variables from regression equations) and Table 7 (after removing) we see that adjustment coefficient equals - 0.32 (- 0.30) with a correct sign (negative). It can be concluded that, any price shock induced by world market causes the domestic cotton price to get out of equilibrium and it takes more than approximately three months to eliminate the disequilibrium.

CONCLUSIONS

The Results Showed That:

- As expected, there is only one-way causal relationship from the domestic price to world price and domestic cotton price is influenced by world cotton price and world cotton market conditions.
- Compared with the results of other studies (indicating no long-run relationship between the domestic and global cotton prices), a lack of linkage between domestic and world cotton prices is changing to a weak relationship between them. It also seems that this relationship is reinforced by the increase in cotton imports than before.
- The period and the results of this paper in comparison with the other studies showed that price effectiveness in short-run is more than long-run and this requires quick responses to reduce the domestic price effectiveness.
- The results show that any price shock induced by world market causes the domestic cotton price to get out of equilibrium and it takes more than approximately three months to eliminate the disequilibrium.

Therefore, based on the results in order to reduce and adjust price fluctuation in the Iran cotton market, following suggestions are offered:

- In defining and editing policy package to support cotton, support policy in the field of cotton trade are most significant and has priority over the other policies.
- Import quota equal to difference between domestic industries consumption and domestic production, seems effective to reduce price fluctuations.

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