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Transmission of International Prices of Corn to Iranian Domestic Markets

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Abstract

Market volatility remains one of the most important research fields in agricultural economics.Interestingly, price transmission mechanism seems to be symmetric in sectors that are likely to be of high political power.This paper analyzes the price transmission effects from international markets to domestic markets for corn in Iran. For this purpose, we estimate the elasticity of substitution between imported and domestically produced goods. Annual data (1996-2012) are analyzed with an econometric framework based on the Maximum Entropy. The result shows that there is a substitution relationship between imported and domestic corn and in the end; domestic prices areaffected from world price more than the short run.

Keywords:
Price transmission, Maximum Entropy (ME), Armington elasticity

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INTRODUCTION

Experience has shown that market price, volatility; especially the unforeseen price variations in response to adversity as well as, spontaneous exogenous or endogenous shocks have important consequences for the welfare of consumers and producers of agricultural products (Gardner and Gardner, 1977). At the producer level, it creates uncertainty and volatility in profit margins and reduces the incentive to invest. At the consumer level, it translates to large price fluctuations that reduce their purchasing power. In most cases, the government becomes concerned about the effect of fiscal policy. In a volatile commodity price regime, there are periods of high volatility and periods of tranquility (Enders, 2004). Price theory plays a key role in neo-classical economics. Prices drive resource allocation and output mix decisions by economic actors, and price transmission integrates markets vertically and horizontally. Economists who study market processes are therefore interested in price transmission processes. Of special interestare those processes that are referred to as asymmetric, for which transmission differs according to whether prices are increasing or decreasing.

Corn crop playsan important role in the Iranian agriculture sector as food;seed and bird food ration.Corn proportion makes 65-70% in commixture of food rations for birds. The quantityof corn import is shown in Figure (1). According to Figure 1, corn import has an increasing trend during 2000-2009. In the other words, during the food crisis of 2007and 2008, the international price of main agricultural commodities such as wheat, rice, corn, and soybeans increased more than twice.

Several studies have analyzed the impact of such price spikes on domestic economies. Peltzman (2000) found an asymmetric price transmission to be the rule rather than the exception. This leads him to the strong conclusion that the standard economic theory of markets is wrong, because it does not predict or explain the prevalence of asymmetric price adjustment (on the other hand, authors such as Gauthier and Zapata (2001) and Cramon-Taubadel and Meyer (2000) recommend caution due to methodological problems associated with empirical tests for asymmetry (Meyer and Cramon, 2004).

Abbott *et al* (2016) investigated thetransmission of world prices in the domestic market in Vietnam. Three alternative model specifications were estimated to test for the effects of home goods, wages, and trade policy interventions on world price transmission. The results show that sectoraltorial variation exists in the world price transmission.

Zhao *et al*. (2010) showed that there is a one-way or both-way leading relation between domestic and international soybean markets; there is an equilibrating mechanism of prices in the world soybean market, which shows that the ability of market correction and the degree of adjustment of the mechanism became higher since the outbreak of the crisis; the future market can reduce the risk of price volatility. Minot (2010) examines the degree to which changes in world food markets influence the price of staple foods in Sub-Saharan Africa. The analysis was based on more than 60 price series from 11 African countries. After examining price trends over 2007–2008, he uses an error correction model

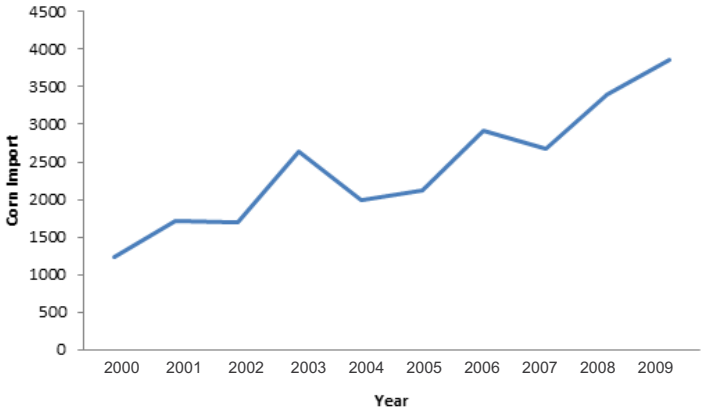

Figure 1: Quantity of corn import to Iran during 2000-2009

to estimate the degree of price transmission. The results of this analysis indicated that staple food prices in these countries rose 63 percent between mid-2007 and mid-2008, about three-quarters of the proportional increase in world prices. Although, statistical analysis indicates that African rice prices are more closely linked to world markets than are maize prices. Dawe (2008)' studyshowed that first the increases in world cereal prices have been accompanied by a real depreciation of the US dollar. Second, domestic commodity specific policies in several of these Asian countries have stabilized domestic prices relative to the change in world prices. Third, for the specific cases, producer or farm gateprices have changed by approximately the same percentage as consumer prices.

This paper clarifies'Armington'Elasticity of substitution in demand between imported and domestically produced corn.The aim of this paper was analyzing the price transmission effects from international markets to domestic markets for corn in Iran.

MATERIALS AND METHODS

Armington Elasticity

Armington (1969) assumed that, besides being differentiated by kind, goods are also differentiated by their place of production. So the Armington Elasticity, measures the degree of substitution between domestic and imported goods, is a key behavioral parameter that drives the results of interest to policymakers. Therefore, the higher value of this parameter shows the closer degree of substitution. In other words, a high value forthis parameter means that imports and domestic supplies are considered by purchasers to be Identical, so in here Armington Elasticity is:

$$\sigma=(\partial \ln M_{i,t}/D_{i,t})/(\partial \ \ln pD_{i,t}/pM_{i,t})$$

where:

Mi→amount of imports for commodity i for each year

Di→ amount of domestic production of commodity i for each year

p_Di→ domestic price of commodity i

p_Mi→ import price of commodity i

σ → Armington Elasticity

Moreover, the study of Warr (2008) shows that the higher the Armington Elasticityimplied,the higher the value of the pass-through elasticity, other things being equal. It means that the higher Armington Elasticity shows the high degree of price transmission from world to domestic market.

Maximum Entropy (ME)

The origin of entropy dates back to 19 th century. In 1948, Shannon developed the Entropy concept as a measure of uncertainty. After in 195, Jaynes formulated Shannon's entropy as a method for estimation and inference and so called Maximum Entropy (ME) principle. More recently, Golan *et al.* (1997) developed the Generalized Maximum Entropy (GME) estimator and started a new discussion in Econometrics.

Suppose that in this study the econometric model (or Base Model) specified as:

$$\ln(M_{i,t}/D_{i,t})=\beta_1+\beta_2 \ln(p_{Di,t}/p_{mi,t}+e_t$$

Therefore, if we show $\ln(M_{i,t}/D_{i,t})$ with y and $\ln(p_{Di,t}/p_{mi,t})$ with x then we have:

$$y_t=\beta_1+\beta_2 x_t+e_t$$

where t (=1, 2,…, T) is the number of data points, β_1 the constant term, β_2 the Armington Elasticity, and e the noise associated to each equation.

In order to specify the (Generalized) ME problem, consider the parametric space supports $z_k=(z_{k1},\ldots,z_{kM})$, k=1,2, M=5 with corresponding probabilities $\rho_k=(\rho_{K1},\ldots,\rho_{KM})$, for the vector of parameters $\beta=(\beta_1,\beta_2)$ and the support $v_t=(v_1,\ldots, v_j)$, J=3, with corresponding weights wt= $(w_{1t},\ldots,w_{jt})$, then we can state the ME problem as:

$$\max_{p,w} H(p,w) = -\sum_{k=1}^{K}\sum_{m=1}^{M} \rho'_{km} \times \ln(p_{km}) - \sum_{t=1}^{T}\sum_{j=1}^{J} w'_{tj} \ln(w_{tj})$$

Subject to the constraints:

$$\sum_{k=1}^{K}\sum_{m=1}^{M} \rho'_{km} \cdot z_{km} \cdot x_{tk} + \sum_{j=1}^{J} w'_{tj} \cdot v_{tj} = y_t$$

for t=1,2,…,T

$$\sum_{m=1}^{M} \rho_{km} = 1 \qquad \text{for} \quad t=1,2,\ldots,K$$

$$\sum_{j=1}^{J} w_{tj} = 1 \qquad \text{for} \quad t=1,2,\ldots,T$$

After the estimation of probabilities with Non-Linear Programing (NLP), we can estimate the coefficient as:

$$\hat{\beta}_k = \sum_{m=1}^{M} \rho'_{km} \cdot z_{km} \qquad \text{for} \quad k=1,2,\ldots,k$$

$$\hat{u}_t = \sum_{j=1}^{J} w'_{tj} \cdot v_{tj} \qquad \text{for} \quad t=1,2,\ldots,T$$

RESULTS

In this study, we estimated Armington Elasticity for corn, for this purpose Base model and Error Correction Mechanism isused, although Annual data (1994-2009) are analyzed. According to Golan *et al*. (1997) and as a rule, we select the estimate from support with Normalized Entropys (ρˆ) nearest to 0.999.

$$s(\hat{\rho}) = \frac{-\sum_{k=1}^{K}\sum_{m=1}^{M} \rho'_{km} \times ln(p_{km})}{k\log(M)}$$

In Table 1, it can be seen that the elasticity of corn is small and the results indicate that substitution possibilities between this products from different sources are indeed limited:

So domestic and import corn is imperfect substitutes. So because of this reason the pass through effect also becomes small.

In the next step, we estimate the Error Correction model (ECM) with the following specification:

$$\Delta\ln(M_{i,t}/D_{i,t})=\alpha_1+\beta_2\Delta\ln(p_{Di,t}/p_{mi,t})+\beta_3\ln(M_{i,t-1}/D_{i,t-1})+\beta_4 \ln(p_{Di,t-1}/p_{mi,t-1})+e_t$$

Where:

$\beta_2 \rightarrow$ the Short Run Armington Elasticity

$-\beta_4/\beta_3 \rightarrow$ the Long Run Armington Elasticity (Gallaway *et al*., 2003; Kapuscinskiand Warr, 1999).

According to the above Specifications, Result is shown in the following tables:

Results show that (Table 2) the elasticity'sis positive in both the short and long run. It means there is a substitution relationship between the Import and domestic corn. Also, the long run elasticity is more than the short run. It shows that in long run domestic prices are affected by world price more than the short run.

CONCLUSION

The last decade, and in particular increased price instability for food and agricultural products both in the world and Iran levels marked the period since 2007-2008. The objective of this paper was to estimate Armington Elasticity's

Table1: Armington elasticity for corn in base model

Parameter supports	A.E.	Entropy estimated	Normalized entropy
[-10 -5 0 5 10]	0.695	18.67	0.826
[-40 -20 0 20 40]	0.360	19.20	0.990
[-60 -40 0 40 60]	0.720	19.22	0.996
[-100 -80 0 80 100]	0.730	19.23	0.999

Table 2: Armington elasticity for corn estimated in error correction model

Parameter supports	A.E.		Entropy estimated	Normalized entropy
	SAE [1]	LAE [2]		
[-10 -5 0 5 10]	-1.3	2.52	21.852	0.992
[-60 -40 0 40 60]	1.04	1	22.09	0.993
[-100 -80 0 80 100]	0.6	0.25	22.11	0.997
[-180 -150 0 150 180]	1.02	1.15	22.14	0.999

[1] *Short Run Armington Elasticity*
[2] *Long Run Armington Elasticity*

for corn with application of the Maximum Entropy Method in Iran. For this purpose two models areused (Base Model and Error Correction Model), the result show that the Armington Elasticity's for corn are positive. Therefore,the world prices of corn affect the Iranian domestic prices of this product especially in theend.The Armington elasticity's implied by the estimates of the pass-through elasticity presented here are well within the range of parameter estimates normally assumed within applied general equilibrium models.

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REFERENCES

1- Abbott, P., Wu, C., & Tarp, F. (2016). Transmission of world prices to the domestic marketing Vietnam.
2- Armington, P. S. (1969). A theory of demand for products distinguished by place of production. *Staff Papers,* 16(1), 159-178.
3- Von Cramon-Taubadel, S., & Meyer, J. (2000). *Asymmetric price transmission*: fact or artefact? Institut für Agrarökonomie der Universität Göttingen.
4- Dawe, D. (2008). Have recent increases in international cereal prices been transmitted to domestic economies. *The experience in seven large Asian countries. FAO-ESA Working Paper*, 8(3), 1-12.
5- Enders, W. (2004). Applied econometrics time series. 2nd Edition. Birmingham, AL: University of Alabama, USA (Eds)
6- Gallaway, M. P., McDaniel, C. A., & Rivera, S. A. (2003). Short-run and long-run industry-level estimates of US Armington elasticities. *The North American Journal of Economics and Finance*, 14(1), 49-68.
7- Gauthier, W. M., & Zapata, H. (2001). *Testing Symmetry in Price Transmission Models, Louisiana State University, Department of Agricultural Economics and Agribusiness*, Working Paper.
8- Golan, A., Judge, G., & Miller, D. (1997). *Maximum entropy econometrics: Robust estimation with limited data*. John Wiley & Sons.
9- Gardner, B.L. & Gardner, B.D. (1977). Discussion on Firch, Baker and Lins. *American Journal of Agricultural Economics*, 59(1), 185-191.
10- Kapuscinski, C. A., & Warr, P. G. (1999). Estimation of armington elasticities: an application to the Philippines. *Economic Modelling*, 16(2), 257-278.
11- Meyer, J., & CramonTaubadel, S. (2004). Asymmetric price transmission: a survey. *Journal of Agricultural Economics,* 55(3), 581-611.
12- Minot, N. (2010). *Transmission of world food price changes to markets in Sub-Saharan Africa*. Washington: International Food Policy Research Institute.
13- Olson, M. (1965). T*he logic of collective action: Public goods and the theory of groups*. Cambridge, Mass.
14- Peltzman, S. (2000). Prices rise faster than they fall. Journal of Political Economy, 108(3), 466-502.
15- Reagan, P. B., & Weitzman, M. L. (1982). Asymmetries in price and quantity adjustments by the competitive firm. *Journal of Economic Theory*, 27(2), 410-420.
16- Reziti, I., & Panagopoulos, Y. (2008). Asymmetric price transmission in the greek agrifood sector: some tests. *Agribusiness,* 24(1), 16-30.
17- Warr, P. (2008). The transmission of import prices to domestic prices: an application to Indonesia. *Applied Economics Letters*, 15(7), 499-503.
18- Zhao, Y., Yang, M., Zhang, Y., & Qi, C. (2010). Impact on the Chinese soybean markets from international prices volatility: Empirical study based on VEC model. *African Journal of Agricultural Research,* 5(15), 1943-1950.

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