The Law of One Price and the Cointegration of Meat Price in the Global Market: the Case of Iran's Market

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Abstract

In view of the importance of the meat imports and the exports of meat in Iran, this study focuses on the status of the global market of meat imports the unit price test in these markets between the years 1961 and 2011 using the market cointegration approach. The results of this study are indicative of prices co-integration in the international market of meat as well as among such major importers as the US, Germany, Italy, Japan, France and Russia. However, the important point is that no price co-integration has been observed between the global prices of meat and the import price in Iran's import market. Moreover, no law of one price has been established in Iran's import market in the long term; and in this respect, these markets lack the appropriate efficiency.

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INTRODUCTION

The influence of such political and economic issues as joining World Trade Organization (WTO), removing tariff barriers and trade restrictions, considering the principles of the General Agreement on Tariffs and Trade, food security etc. on the international trade of agricultural commodities and food all point to the importance of the law of one price and the cointegration of the global and domestic prices. Two markets in different locations are joined only when the prices of the traded goods in the importing market equals such prices in the exporting market plus transportation costs and other delivery expenses. In other words, the market is integrated for those products in which the prices of the goods move together over the time; implying that the law of one price is preserved.

Existence of distance between selling markets of different products and manufacturers leads to the price differences between such markets. The efficiency of such markets is assessable using the relationship and integration criterion. The law of one price suggests that when there are no unusual transaction costs, the price of similar goods in different countries will be the same as long as they are calculated based on a common currency. The largest meat importers in the global markets are countries such as US, Germany, Italy, Japan, France and Russia. Iran too has always been one of the importers of meat from the global market, too.

Several fluctuations can be observed in the quantity and value of imports in the global market of meat. As for the value of the meat imports from the global market, France had the highest rate in the early years, whereas in more recent years the US has taken over. In recent years, the import trends of the US, Russia and to some extent Japan have been negative, while such trends are still positive for the other countries.

So far, several studies have been done in the area of market integration and the law of one price. Baffes (1991) examined the relationship of seven products among four countries using the law of one price. The findings suggest a convergent relationship among thirteen markets out of the available sixteen markets. Mohanty *et al.* (1998) examined the law of one price in the international market of wheat, sugar, wool and tea

in Canada, Australia, US, New Zealand and England. In this article, the two approaches of general and detailed co-integration are employed and their results are compared. In three cases, the general convergent approach has confirmed the law of one price while the detailed convergent approach ratifies long term relations in 8 pairs. Kuiper (1999) investigated six regional corn markets using Johansen's integrative approach. The results obtained point to the long term relations among such markets. Zanias (1993) studied the stability of the corn, milk, and meat and potatoes market among England, Belgium, Denmark, France, Germany, and Italy. The results indicated that the milk and corn markets show the least and most stabilities respectively. Delpachitra and ST Hill (1994) studied the law of one price in New Zealand through investigation of the data provided by 15 agricultural companies. The results showed that market stability is not feasible over short periods of time. Vinuya (2007) investigated the stability of the law of one price in the shrimps market using data on import price provided by Japan, US, and the European Union. The findings show that there is strong stability between Japanese, American and European markets, and that the law of one price is in effect in the shrimps market. Toosi (2013), used Error Correction Model and Engle-Granger Method to investigate the price linkages between domestic and world cotton market. The variables of the study are domestic and world cotton monthly prices. The results showed 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. Katrakilidis (2008), explored the long run linkages among milk prices of five European markets in a dynamic framework by employing multivariate cointegration analysis and appropriate Vector Error Correction (VECM) specifications. The detection of causal effects and the identification of possible dominant markets that drived the prices of other markets was carried out by means of Granger causality testing and exogeneity tests. Finally, the short nm dynamics of the milk markets are explored by applying variance decomposition analysis. Fossatti *et al.* (2007), studied the relationship

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between a set of commodity prices in a small open economy like Uruguay and the corresponding international and regional prices. The empirical methodology used is the multivariate cointegration procedure based on maximum likelihood methods introduced by Johansen. In the case of cereals, the evidence suggested strong market integration between domestic and regional markets and, to some extent, also to international markets. Therefore, directly or indirectly, domestic prices were connected with the efficient price signal. Results for beef indicate strong market integration between the domestic market and the regional market, which is not so well connected with international markets. Thus, domestic price appears to be linked to a regional price that is not linked to the efficient price signal.

This study investigated whether the law of one price can be established in a market with clear fluctuations in the quantities and values of imported meat in major importing countries? Is Iran's import market competitive with the world market? This study too, will also investigate the relationship of the meat import markets. The overall aim was to investigate the world market relationship and the status of Iran it.

MATERIALS AND METHODS

In this study, at first, stationary of variables was examined and then Engel-Granger's as well as Johansen's co-integration tests are used to assess market integration. Integration and Co-integration analysis entered economic literature in 1980, and is considered by many economists as one of the most important developments in experimental modeling. If two or more variables possess varying means of variance and covariance over time, they will be used in regression analysis. The obtained regressions will be false. However, this does not hold true if the same variables converge. In essence, co-integration means studying the stability of the relationship between variables in the long term. This concept enables researchers to look into the possible existence of an equilibrium or stability among two or more time series variables which are by themselves non-stationary. We employed Engle-Granger's co-integration test. Based on this test, if there is long term equilibrium between two

non-stationary variables, they converge.

Before conducting the above test, examination of the stationary and non-stationary time series variables is necessary as a pre-condition for a co-integration test are for the variables to be non-stationary and co-convergent. This is to say if a convergent variable is compounded d times to become stationary, it then has d roots of grade d, as shown with I (d).

To examine the stationary of the variables, the unit root test is utilized. In the present study, the Augmented Dickey – Fuller (ADF) Test is used for this purpose.

In the next stage and in the case of nonstationary of variables, their co-integration will be studied. Engel- Granger approach proceeds as follows: first a regression is obtained using OLS to remove the false statements ($U_t = y_t - Bx_t$). Then using ADF, we investigate the stationary of the false statements. If they are stationary, we conclude that the variables are co-integrated. To investigate market relatedness, we use the following:

$$p_{it} = a_0 + a_{jt} + E_t \qquad (1)$$

Where p_j, p_i represents price series for a commodity in two markets and E is the false statement. If E_t is stationary, we conclude that the price series have long-lasting relatedness. The most common and important test used for assessing long term equilibriums among time series variables is what was presented by Johansen in 1990. The advantage of this approach over the others is that the trends and kinds of the long term relationships are also shown. Determining such trends among variables is done using VAR.

$$\Delta Y_t = \beta Y_{t-P} + \sum_{i=1}^{P} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \qquad (2)$$

Johanesen proposes two criteria of λ_{trace} and λ_{Max} for testing long run relation. (Johansen and Juselius, 1990).To obtain the intended results, price data from imports of meat by US, Germany, Italy, Japan, France, Russia and during the years 1961-2011 available at FAO website were used. Eviews7 Software was used to analyze the data.

RESULTS AND DISCUSSION

As shown in the results obtained from the validity of variables of the Augmented Dickey

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Table 1: Analysis of the validity of the variables under investigation.

Variable	Statistic	Critical values at 0.01
France import price	-5.21	-4.17
Germany import price	-4.23	-4.17
Iran import price	-4.30	-4.17
Italy import price	-6.23	-4.17
Japan import price	-7.45	-4.17
Russia import price	-4.80	-4.17
US import price	-4.87	-4.17
Average Global import price	-4.68	-4.17

Table 2: Determining the optimum stoppage in the VAR model for meat import.

Stoppage	LogL Statistic	LR Statistic	FPE Statistic	AIC Statistic	SC Statistic	HQ Statistic
0	-75.38	NA	2.26×10-6	6.86	7.21	6.96
1	32.18	143.42*	2.07×10-8	1.98*	6.73*	2.71*

Source: current study

Table 3: Trace test in Johansen Juselius.

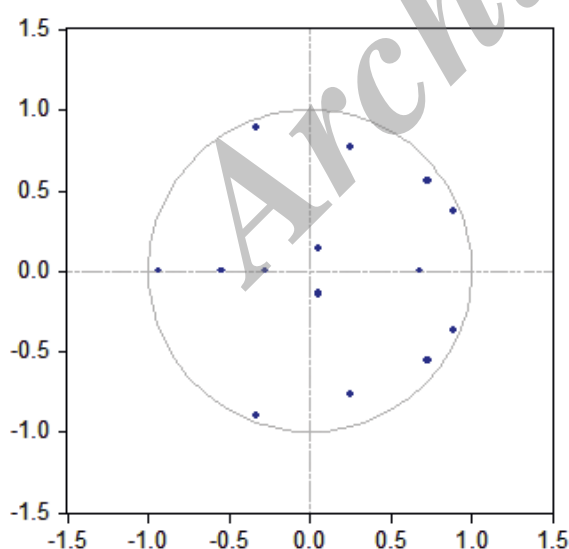| Null hypothesis	Eigenvalue parameter	Trace statistic	Critical values at .05
Nonexistence of long-term relationship	0.89*	164.68	150.56
More than one long-term relationship	0.78	109.70	117.70
More than two long-term relationships	0.67	73.73	88.80
More than three long-term relationships	0.56	47.36	63.88
More than four long-term relationships	0.46	27.71	42.92
More than five long-term relationships	0.32	13.11	25.87
More than six long-term relationships	0.15	3.86	12.52

Source: current study

Figure 1: Inverse Roots of Auto Regressive Characteristic Polynominal

is necessary to first determine the amount of optimum stoppage in the co-integrated model. To this end, a VAR model was prepared, after which the optimum stoppage was elicited. As shown in table 2, the optimum stoppage in this model is equal to 1. Thus, such convergent models have lower stoppage rates.

To ensure the validity of the VAR model, it is necessary to run tests such as the inverse root. As can be seen in Figure 1, the present model lacks self-regressive inverse root, and as such is appropriate for the case at hand. Also the normality tests of existence or nonexistence of correlation and heterogeneity of variances was also studied, which also proved to be effective.

Ultimately, to study the law of one price among big importers of meat in the global market, integrative models have been used. The results indicate that the import prices in the global market of meat tend to be similar in the long

Fuller test, all the variables under investigation are of the validity level I (1).

To assess the law of one price in this case, it

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Table 4: Max-Eigen test in Johansen Josilus models.

Null hypothesis	Eigenvalue parameter	Trace statistic	Critical values at .05
Nonexistence of long-term relationship	0.89*	54.98	50.60
More than one long-term relationship	0.78	35.97	44.49
More than two long-term relationships	0.67	26.37	38.33
More than three long-term relationships	0.56	19.65	32.12
More than four long-term relationships	0.46	14.60	25.82
More than five long-term relationships	0.32	9.25	19.39
More than six long-term relationships	0.15	3.86	12.56

Source: current study   *P< 0.05

Table 5: Trace Test in Johansen Juselius.

Null hypothesis	parameter	Trace statistic	Critical values at .05
Nonexistence of relationship	0.65*	96.13	95.75
More than one relationship	0.54	64.89	69.81
More than two relationships	0.47	41.76	47.85
More than three relationships	0.29	22.52	29.80
More than four relationships	0.21	12.22	15.49
More than five relationships	0.12	3.29	3.84

Source: current study   *P< 0.05

Table 6: Max-Eigen test in Johansen Juselius models.

Null hypothesis	parameter	Trace statistic	Critical values at .05
Nonexistence of relationship	0.65*	41.24	40.08
More than one relationship	0.54	23.12	33.87
More than two relationships	0.47	19.24	27.58
More than three relationships	0.29	10.30	21.13
More than four relationships	0.21	7.32	14.26
More than five relationships	0.12	3.29	3.84

Source: current study   *P< 0.05

term; and as such, one can conclude that such a market tends to be competitive and that the prices are convergent. In fact, considering tables 3 and 4, and with reference to both Trace and Max-Eigen tests, the null hypothesis stating that there is no long term relationship among import prices in big countries is rejected, and this relationship is well proved.

In the next section, Iran's status has been sep-arately considered in terms of long term relationships. To his end, such relationships have been studied on meat import prices in comparison to the (average) world prices. The results of both statistics of Trace and Max-Eigen reveal that in all 5 cases, existence long term relationship between world prices and the import price of meat for Iran is not confirmed- hence lack of the law of one price in this case. This could be

Table 7: Trace Test in Johansen's model.

Null hypothesis	Eigenvalue parameter	Trace statistic	Critical values at .05
Nonexistence of along term relationship	0.32	18.07	25.87
More than one long term relationship	0.19	6.63	12.52

Source: current study   *P< 0.05

Table 8: Max-Eigen test in Johansen model.

Null hypothesis	Eigenvalue parameter	Max-Eigen statistic	Critical values at .05
Nonexistence of along term relationship	0.32	11.45	19.39
More than one long term relationship	0.19	6.63	12.52

Source: current study   *P< 0.05

due to variable tariffs drawn up on meat import. The law of one price indicates that prices could be similar based on a common currency when there are no business impediments or unusual expenses. Considering the existence of such variable tariffs on meat import and their temporary lifting in some years (as in 2010), the law of once price will not be observed in the Iranian market. The results from one of the existing five approaches are shown in tables 7 and 8, which are confirmed by other approaches as well.

CONCLUSION

As can be seen in the results of the present study, the global market of meat import is generally competitive market over the long run; however, Iran's market of meat import, contrary to its, is not competitive with the global market. In fact, global meat market has been very efficient, whereas the same cannot be said for its Iranian counterpart. This lack of competitiveness can be, as mentioned earlier, due to drawing up variable tariffs on meat import. To support domestic producers of meat, such tariffs have been varied by the government continuously, which indicates that such producers cannot compete with their off-shore counterparts. However, if in this particular case, instead of varying tariffs, the government attempts to reduce the finished cost of meat at home and reduce its price, then such local businesses would be able to compete with their international rivals, and the efficiency of the meat market will be improved as well.

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