A Study on the Price Transmission in Sharp-headed and White Shrimp Markets in Iran

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Abstract: Aquatics are considered a suitable food source for providing consumable protein for people, and development of aquaculture in Iran is of special importance. Therefore, considering the importance of Price transmission in various levels of the market, and the relation between price transmission from farm to retail level with efficiency of the marketing system, the method of price transmission from wholesale to retail is examined regarding sharp-headed and white shrimp. For this purpose, wholesale and retail prices of two products during 2002 to 2011 were used in form of monthly data. Granger's causality test was used to examine the relation of causality between two levels of wholesale and retail prices. Test results indicate a one-way causality relation from the level of wholesale prices to retail prices. In addition, the most important findings of the research support the fact that price fluctuations on the wholesale level are asymmetrically transmissionred to the retail level. In other words, sensitivity of retail prices compared to the increase and decrease of wholesale prices are not equal.
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1-Introduction

Providing food safety is one of the most important factors in creating a progressing society. Based on nutrition culture, some products withhold special positions. For example, the man main food of Asian countries, which is seen on most of their tables, consists of agricultural products and seafood. On the other hand, deterioration of agricultural products and aquaculture has a wide range of discussion, and warehousing of these types of products is very costly, and in undesirable conditions, will result in their food quality degradation.

Regarding shrimp products in Iran, we have witnessed price fluctuations, mainly because of seasonal price fluctuations of this product and production fluctuation due to bad weather and atmospheric conditions, and the Asian continent and the majority of producing countries like Iran are not an exception.

One of the other reasons affecting agricultural product prices is governmental intervention. Most of these interventions are through interference in agricultural product markets, sometimes in form of determining a bottom price to support of producers, and other times via providing different savings to producers with the aim of price cuts in favor of the consumer.

One of the major problems most markets are faced with is marketing margin, which has added importance in agricultural and fisheries products. Considering that production in the fisheries and agricultural field accounts for many risks, and has more production risks compared to industrial products, therefore the producer is under much more physical and psychological pressure. Therefore, marketing margin is of great importance in agricultural products.

Definition of Marketing Margin: Price difference between producer and consumer price is called Marketing Margin, which is mainly due to marketing services, which include product type, consumer characteristics, market structure, transportation system, packaging industry etc.

If increase or decrease of producer price does not affect the price the consumer pays, marketing margin will become more important, and this type of price transfer is called asymmetric transmission.

In Hans's point of view, there are two types of asymmetric transmission:

- Short-term: the immediate effect of increase or decrease in produce price does not affect retail price, but the long-term effect is equal.
- Long-term: increase in producer price has a different effect in the short-term compared to price reduction in the long-term. Long-term asymmetry means that intermediaries are continuously increasing their margin, while short-term asymmetry is considered a temporary effect on marketing margin. In order to find out the manner of price fluctuation transfer two economic models namely Hook and Error Correction are utilized. Hook's model is used if data are

non- stationary or are not in relation with each other on the long-term, and if data are nonstationary and are in relation with each other on the long-term, then the Error Correction model is used. Moreover, Convergence test is utilized to examine the long-term relations.

On-farm market includes:

- Seller: Farmer
- Buyer: wholesaler, retailer, and families

Intermediaries are persons familiar with market conditions and attempt to buy products from wholesalers and retailers.

Asymmetric transfer of prices is of great importance, because in addition to showing a great lack of economic theories, it can provide concepts and applications for economy policy makers.

Types of Price Transfers:

- Horizontal: price transfer of a product from one country's (region) market to another country's (region) market.
- Vertical: price transfer of a product in production levels is wholesaling and retailing inside the country.

A number of studies have been carried out in this regard. Among them are:

Kinokan and Focker (1987): the method of price transfer from the farm to retailers for four dairy products butter, cheese, raw milk, and ice cream was examined in the USA. Results showed that increase in farm prices compared to reduction of farm prices transfer in a faster and more complete manner to retail level, and price transfer has been done in an asymmetric way.

Agoyar and Kerno (1997) showed that in dairy processing industries of Brazil, increase on farm prices are transferred faster to retail.

Han (1990) concluded that beef and pork price transfer are asymmetric.

Keps and Sherol (2005) carried out the price symmetry test in four US states for raw milk and milk with 2% fat. Their results indicated asymmetric price transfers.

Ward (1982) regarding price transfer of fresh vegetables concluded that reduction of on-farm prices transfers in a faster and more complete manner.

Hosseini and Nikookar (2006) attempted to study the method of price transfer from producer to consumer for poultry in Iran during 1998 to 2002. Their results indicated that any increase in poultry producer prices transfers completely to retail, while this transfer is not complete.

Ghahremanzadeh and Falsafian (2005) by carrying out a study on the method of price transfer in Iran's meat market during 1991 to 2001, concluded that increase in producer price which results in reduction of marketing margin, transfers even faster to retail prices.

Moghadassi and Morab (2007) commenced a study on the method of price transfer from farm to retail in the tomato and potato product market. Results of their study indicates an asymmetric price transfer, and producer price increase is more complete, but is transferred to retail in a slower pace compared to price decrease.

Moghadassi and Ardakani (2007) carried out a study in examining the method of price transfer in the egg and poultry market of Iran. Their results validated the fact that price fluctuations in the producer level are symmetrically transferred to the retail level.

Moghaddasi and Fazeli (2007) studied garden product market price (case study on date sand pistachio nuts).

Hosseini and Doorandish (2006) examined the price transfer model of Iran's pistachio in the world market.

Hosseini and Saraeishad (2009) studied the method of price transfer in the trout fish culture in the Fars province. Their results validated the fact that price fluctuations on the wholesale level are transferred asymmetrically to the retail level.

2-Material and Methods

In this article, shrimp retail prices (Pr) and wholesale prices (Pf) were used in a monthly 10-year period from 2002 to 2011. Data were obtained from Iran's Fisheries Organization. In order to eliminate inflation, Consumer Price Index (CPI) was employed.

In this research, price transmission, transmission prices elasticity, and causality relation between prices in two levels of wholesale and retail were examined and analyzed for two products, sharp-headed shrimp and white shrimp.

In later studies various methods have been employed in order to examine the method of price transmission in different levels of the market including Houck's method, Angel-Granger's convergence test, and error correction model.

Because data from the time series have been utilized, firstly, variable stationarity was examined using unit root test, Dickey- Fuller's statistic, Phillips-Perron and KPSS, and if the time series variables are stationary, Houck's model will be used. However, if variables are non-stationary, firstly, the long-term relationships of variables in different levels of the market are examined using Johansen's test, and if cointegrated, the error correction model will be used for analyzing price transmission model.

In order to study the method of price transmission, normally a quantity namely

transmission elasticity is used. As mentioned in the introduction, price transmission elasticity shows the percentage of retail price transmission for one percent of wholesale price change. In 1975, Gardner presented various equations for calculating this elasticity. However, we know that sources of price transmission are different. If product offer is the reason for price change, price transmission elasticity is lower than one, and if demand is the reason, provided that the agricultural product offer is more elastic compared to marketing savings offers, price transmission elasticity will be near or more than one. However, empirical studies have indicated that higher marketing services elasticity is due to agricultural products offer elasticity.

The following method are used in order to examine the method of price transmission in a market:

- Houck's model
- Error Correction Method (ECM)

In this article, monthly price time series data have been used. Therefore, some important tests must be carried out.

Granger's causality test is used in order to prices effective from each other. Dickey Fuller, Phillips-Perron, and KPSS tests are employed for examining stationarity.

A random process is stationary when the average and variance are constant in time and the covariance value between to time periods only depends on the distance or gap between the two periods, and does not relate to the actual time of real calculation of the variance.

If the absolute magnitude of the calculated statistic in Dickey Fuller and Phillips-Perron's tests is more than the absolute magnitude of critical values, then the hypothesis related to stationarity of the time series is not rejected. Otherwise, data are stationary. If data are stationary, a false regression will be produced, because both dependent and independent time series variables are greatly inclined to time, and therefore, the high value of observed R^2 is due to presence of a time variable, and not an outcome of actual relation between variables. Therefore, data must be stationary.

Now, if the time series is stationary, we use Houck's model:

$$Pr_t - Pr_0 = a_0 t + a_1 \sum_{i=0}^{M_1} \Delta Pf_{t-i}^{+} + a_2 \sum_{i=0}^{M_2} \Delta Pf_{t-i}^{-} + e_1$$

where Pr is logarithm of retail price, Pf is logarithm of price on the farm, ΔPf^{+} is price increase on the farm, ΔPf^{-} is price reduction on the farm, and M1 and M2 are gap lengths.

The variable coefficient equality hypothesis test is used to examine the symmetric or asymmetric nature of price positive and negative transmission shocks between the two levels of the market. $a1$ and $a2$ respectively, are coefficients of effect of increase and decrease of on-farm prices on wholesale prices.

This equation is estimated using the ordinary least squares method, and length of lag can be obtained using the Akaike -Schwartz or adjusted R^2 tests .

The null hypothesis can be defined as below:

$$H_0: \sum_{i=0}^{M_1} a_{1i} + \sum_{i=0}^{M_2} a_{2i}$$

The above equation is easily calculated using OLS.

If $a1$ and $a2$ are equal and positive, price transfer is symmetric, otherwise it is asymmetrical.

Wald's test is employed in order to test rejection or acceptance of the null hypothesis. This test is based on the F and X^2 statistics. Because all assumptions are linear, therefore in order to reject or accept each assumption, the F and X^2 statistics are compared with their critical values, and significance is specified in this regard.

Now, if Dickey Fuller's test results imply non-stationarity, the method of price transmission will change. Here we face two different conditions:

1. If data are cointegrated, meaning that they are in relation with each other on the long-term, the ECM model will be used. Johansen's test will be employed for data cointegration.
2. If data are not in relation to each other on the long-term, Houck's model will suffice.

Granger and Lee (1989) introduced the Error Correction Model (ECM) as follows:

$$\Delta P_{rt} = B_0 + B_1 \Delta P_{ft} + B_2^{+} ECT_{t-1}^{+} + B_2^{-} ECT_{t-1}^{-} + \sum_{i=1}^{P_1} B_{3i} \Delta P_{rt-i} + \sum_{i=1}^{P_2} B_{4i} \Delta P_{ft-i} + v_i$$

$$ECT_{t-1} = P_{rt-1} - a_0 - a_1 P_{ft-1}$$:

Resulting correction component from convergence regression between P_{rt} and P_{ft}:

In the above regression, retail price change to wholesale price change in the t time, and wholesale prices of the previous period were examined.

B2- and B2+ coefficients show the amount of retail price adjustments compared to positive and negative marketing margin shocks, respectively. The null hypothesis is defined as below:

$$H_0: B_2^{+} = B_2^{-}$$

Acceptance of the null hypothesis indicates symmetry in price transmission, and declining it represents asymmetry in price transmission. In this article, we attempt to examine causality between retail and wholesale markets, which finally, shows the effect of both these markets in different levels. In other words, through the causality test, we can

recognize which market is determinant and effective on price and price change in other markets.

In this article, Granger's causality test is used as follows:

$$Pw_t = \sum \propto_i P_{w_{t-i}} + \sum \beta_j Pr_{t-j} + U_{1t} \quad (1)$$

$$Pr_t = \sum \lambda_i P_{r_{t-i}} + \sum \delta_j Pw_{t-j} + U_{2t} \quad (2)$$

With the assumption of non-correlation of disorder components, the following four conditions are extractable:

1. If the sum of coefficients with the Pr interval in equation (1) are non-null statistically ($\sum \beta_j \neq 0$), and sum of coefficients with Pw interval in relation (2) are statistically zero ($\sum \delta_j \neq 0$), causality is one-way, from Pr to Pw.
2. If statistically $\sum \beta_j = 0$ and $\sum \delta_j \neq 0$, then causality is one-way from Pw to Pr, meaning that the wholesale market is the reason behind price changes in the retail market.
3. If the sum of Pw and Pr in both is statistically significant and noon-zero in both regressions, there is a two-way causality, and both markets influence each other.
4. If coefficients of Pw and Pr are not statistically significant in both regressions, then both markets are not in relation and are considered independent.

The optimal interval between equations (1) and (2) of the causality test must be determined for each variable. For the coefficients test, in each assumption of the causality test, parent coefficients test will be used.

3-Results and Discussion

Since data are time series, therefore firstly in order to examine stationarity of variables, the unit root test is used. By obtaining values for Dickey Fuller and Phillips-Perron tests, which in terms of absolute magnitude are larger that critical price values for both products in both levels of the market, therefore all variables are stagnant. Optimal interval for each variable is determined based on Akaike information criterion. Test results are given in table (1).

In order to examine the relation, Granger's causality test was employed. At first, the optimal interval for each variable was determined in each equation based on the least Akaike information criterion. For this, the price variable of each product in each level was regressed separately on its interval values, and optimal interval was determined in each equation for that variable. Then, the equation was regressed on the other variable in different intervals, and based on the least Akaike information criterion, the optimal interval for the other variable was determined. After determining variable optimal intervals, the following equations were appraised, and each of the assumptions of the causality test was examined based on the parent test. The results of this evaluation are given in table (2) to (4).

$$Pw_t = \sum \propto_i P_{w_{t-i}} + \sum \beta_j Pr_{t-j} + U_{1t}$$

$$Pr_t = \sum \lambda_i P_{r_{t-i}} + \sum \delta_j Pw_{t-j} + U_{2t}$$

Tables (2) and (3) present the causality test results between the two wholesale and retail of sharp-headed and white shrimp. It is evident that causality is rejected from retail to wholesale, and therefore, wholesale prices are not influenced by prices in the retail level. Based on this fact, for sharp-headed and white shrimp, there is a causal relation from wholesale to retail, and sharp-headed and white shrimp at the retail level, are influenced by wholesale market prices.

Table (3) presents results of the causality test between the two wholesale and retail levels of white shrimp. Based on the test results, null hypothesis is accepted in the first equation, therefore causality from retail to wholesale is rejected, and therefore prices in the wholesale level are not influenced by prices in the retail level.

Considering that all variables of the model are stagnant, therefore in order to examine the symmetry of price transfer in both levels of wholesale and retail, Hook's model was employed. For this, firstly, optimal interval of variables was determined in the model, and then the models were assessed. Assessment results are given in table (5). As observed in this table, for shrimp, price reduction or negative shocks have greater effect on retail prices, in a way that for sharp-headed shrimp, positive price shock in direction of wholesale in the same period, is transferred to the retail level with a coefficient of 0.4155, while price reduction influences the retail level with a coefficient of 0.4766. Hence, asymmetry that was defined in the article introduction is the outcome of this market, and positive and negative shocks from wholesale to retail are asymmetric. This result is validated using Wald's test. According to table (4), the zero-assumption on the basis of equal sum of price increase coefficients in various intervals, with the sum price reduction coefficients for both products, considering significance of the F statistic, is rejected. Therefore, price transfer in the shrimp market is asymmetric.

4-Conclusion

One of the problems of agricultural markets is lack of suitable tools for economy management

decisions. The current study with the aim of analyzing the price model and efficiency of the shrimp market, attempt to examine price transfer, marketing margin, and causality relations between different markets. Result of Engel-Granger's causality test showed that a causal relation exists from wholesale to the retail level.

Considering stationarity of variables, Hook's model was employed in order to examine the symmetry of price transfer between different levels of the market. Results showed that for these two markets, sum of price reduction coefficients or negative price shocks from wholesale to retail level had a faster effect to those of positive price shocks. Moreover, considering that variables are entered in the equation in logarithmic form, estimated coefficients indicated elasticity.

Table (1): Unit Root Test for Determining Stationarity of Shrimp (Sharp-headed and White) Price Variables,

Test		ADF			PP			KPSS	
Variable name		ADF Statistic	Critical values	p-value	PP statistic	Critical values	p-value	KPSS statistic	Critical values
Sharp-headed Shrimp	Wholesale	-3.950	-3.448	0.129	-4.078	-3.448	0.008	0.068	0.146
	Retail	-3.664	-3.448	0.000	-5.644	-3.448	0.000	0.079	0.154
White shrimp	Wholesale	-10.037	-3.448	0.000	-10.013	-3.448	0.000	0.062	0.146
	Retail	-10.432	-3.448	0.000	-11.842	-3.448	0.000	-0.104	0.146

Source: Study findings

Table (2): Causality Test Between Wholesale and Retail Levels of Sharp-Headed Shrimp

Causality relation	Rejection or acceptance of null- hypothesis	Parent test result	null- hypothesis	Model variables
Causality from retail to wholesale is rejected	H_0 accepted	F=0.8165 Probability = 0.4455	$\sum B_j = 0$	Pw, Pr (2, 2) Pr→*Pw*
Causality from wholesale to retail is accepted	H_0 rejected	F=2.6064 Probabaility=0.0009	$\sum \delta_j = 0$	Pr, Pw (2, 2) Pw→*Pr*

The numbers in parentheses are the optimal interval of each variable in the model.

Table (3): Causality Test between Wholesale and Retail Levels of White Shrimp

Causality relation	Rejection or acceptance of null- hypothesis	Parent test result	null- hypothesis	Model variables
Causality from wholesale to retail is accepted	H_0 rejected	F=4.0236 Probability = 0.0209	$\sum B_j = 0$	Pw, Pr (2, 2) *Pw* → Pr
Causality from retail to wholesale is rejected	H_0 accepted	F=0.8700 Probabaility=0.4221	$\sum \delta_j = 0$	Pr, Pw (2, 2) Pr → *Pw*

The numbers in parentheses are the optimal interval of each variable in the model.
Source: Research findings

Table (4): Hook's Model and Wald's Test Assessment Results for Symmetry of Various Types of Shrimp Price Transfer

Variable	Price change coefficient		Wald's test result	null- hypothesis acceptance or rejection	Price transfer symmetry
	Increase	Reduction			
Sharp-headed shrimp price	0.4155	0.4766	F=27.9205 Probability = 0.000	Rejected	Asymmetric
White Shrimp	0.6125	0.6792	F=3.8295 Probability = 0.0528	Rejected	Symmetric

Source: Research Findings

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