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Full Length Research Paper

Marketing price transmission analysis in the Iranian rice market

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The goal of this paper is to test whether changes in the marketing margin between the farm and the retail prices can result in an asymmetric relationship between the on farm and the retail prices in the rice market of Iran. By separating the transaction cost variation into two regimes, this paper utilizes a two-type TVECM with the error correction. The empirical results show that when the marketing margin is lower than the threshold value, the market system operates freely and there is feedback between the farm and retail prices. However, when the marketing margin is higher than the threshold value, the government intervenes in the market and the causality between the farm and retail prices no longer exists. The conclusions are as follows: Changes in the marketing margin can cause the asymmetric price transmission between the farm and retail prices in Iran's rice markets; therefore, ignoring the effect of the marketing margin could lead to errors in the models. When the marketing margin is higher than the threshold value, the government intervenes in the market and the causality between the two prices is broken.

Key words: Marketing margin, price transmission, price asymmetry, threshold model.

INTRODUCTION

Rice has long been the most important staple food in Iran, as well as one of Iran's most important agricultural products. The Iranian government has in the past employed a range of measures to maintain the price stability for agricultural products, including the "375 Rent Reduction" in 1949 and the "land to the tiller" policy in 1953. These policies were effective in stimulating large increases in agricultural production, which had two positive consequences: the policies solved problems of food supply and also helped achieve the policy goal of "developing industry through agriculture." As Iran's economy modernized, incomes rose and standards of living improved; the consumption of rice gradually fell, as it lost its status as the pre-eminent staple. However, the government continued to encourage rice production out of food security considerations, which results in the phenomena that rice consumption is dropping off steeply, while there is currently still excess production in Iran. This demonstrates that with government intervention in the agricultural sector, it is often unable to adapt to changes in the actual supply and demand in the market. However, because of the need for food security, it remains necessary for the government to intervene in the rice market. What is vital is that the government has a full understanding of how information is transmitted between the rice producers and retailers and of the effects of changes in the marketing margin.

Only with such an understanding, it is possible to develop effective long-run policies and short-run adaptive measures. The two most common varieties of rice available on the Iranian market are A and B, there is a gap between the farm and market retail prices, which reflects the marketing margin between the farm and the retailer. We can also see that for both varieties of rice, the marketing margin reflected in the price gap appear to be stable, which implies that the farm price and the retail price may be co-integrated in the long-run. Furthermore, the fluctuations in the marketing margin as prices vary. Why might the marketing margin deviate from the long run equilibrium over the short term? Variation in production costs and changes in the weather and human activities are all causes of short-run asymmetric

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adjustments in the markets. This fluctuation may cause nonlinear fluctuations and limited cycles in the farm and the retail prices, despite their relatedness. These nonlinear effects may cause more short-run deviations from the equilibrium for the marketing margin, which can in turn, generate asymmetric price adjustments in the rice markets. Because of this, models which do not consider nonlinear relations between variables are certain to produce biased results.

The objective of this paper is to test whether changes in the marketing margin between the farm and the retailer, as measured by the price difference, can cause an asymmetric relationship between the farm and the retail price. For this objective, we establish the following three hypotheses. Hypothesis 1 is that there is a co-integration relationship between the farm and the retail prices. Under the null hypothesis of Hypothesis 1, the marketing margin exists and the long-run relationship between the two prices is stable. Hypothesis 2 is that given the established co-integration relationship, there is no threshold relation between the farm and the retail prices. Hypothesis 2 could be examined by the linearity test. When hypothesis 2 is rejected, we could construct the threshold model and divide the model into two regimes. Hypothesis 3 is that the causality between the farm and the retail prices does not vary with the regimes. The benefit of testing these three hypotheses is that we will be able to calculate a critical level for the marketing margin, which will provide a rational basis for the government to decide when to intervene in the market. consumers will also be able to judge whether the market price for rice is within reasonable limits.

This will help prevent profiteering by businesses in the supply chain, which is against the interests of both the farmers and the consumers. We employ the farm and retail prices of the two varieties of rice mentioned before to conduct the empirical study. The results show that:

1) There is a co-integration relationship between the farm and retail prices;
2) The linearity test rejects hypothesis 2, which indicates that the threshold effect exists; and
3) Under the two regimes, the causality test result shows that when the marketing margin is lower than the threshold value, the market system operates freely and there is feedback between the farm and the retail prices.

But when the marketing margin is higher than the threshold value, the government intervenes in the market and the causal relationship between the farm and the retail prices no longer exists.

LITERATURE REVIEW

In recent years, empirical analyses of price transmission for agricultural products have attracted attentions among economists. Von Braun (1998) analyzes vertical. Price transmission between farm gate and wholesale pig prices in Germany using an error correction model (ECM). To incorporate also effects of the marketing margin into models of price transmission, the author develops the threshold error correction models (TECM). Many studies have been undertaken based on works by Tong (1978) and Balke and Fomby (1997). For example, Obstfeld and Taylor (1997) analyzed the ‘Law of one Price’ within such a framework. Goodwin and Harper (2000) used a threshold error correction model to quantify the spatial integration in United States corn and soybean markets. Ben-Kaabia et al. (2002) and Ben-Kaabia and Gil (2007) estimate the price transmission between the vertically related stages of the Spanish lamb market using a threshold model. Meyer (2004) argues that a three-regime threshold vector error correction model (TVECM) is most suitable for analysis of the bi-directional price adjustment in the presence of the to analyze the dynamics of the transaction cost and to detect any co-movements with (policy induced) changes in the financial environment. Poghosyan and Kuper (2008) estimate a TVECM model for United States gasoline and crude oil prices and find Asymmetric price transmission seems to be important because the addition showing deep gap of economic theory can provide concepts and applications of economic for policy evidence for the threshold effect after February 1999. makers. There are two types of price transfer; 1) Horizontal is transferring product price from the market of a country (region) to market of another country (region); 2) Vertical is transferring product price in producer level, wholesale and retail within a country. It has been reviewed as the existing marketing margin. These models can account for the effects of the marketing margin in the price transmission analysis even when the transaction cost data are unavailable.

In other applications, Frey and Manera (2007) review the existing empirical literature on the price asymmetries in commodities, providing a way to classify and compare different studies that are highly heterogeneous in terms of econometric models and type of asymmetries and empirical findings. Poghosyan and De Haan (2007) use the TVECM for a fixed rolling window empirical literature on the price asymmetries in commodities, providing a way to classify and compare different studies who are highly heterogeneous in terms of econometric models and type of asymmetries and empirical findings (Aguiar and Santana, 2002; Alizadeh, 2003). The degree of price transmission can provide at least a broad assessment of the extent to which markets are functioning in a predictable way, and price signals are passing-through consistently between different markets. Price's transmission is affected by several factors such as transport and transaction costs, market power, exchange rate, border and domestic policies, and product homogeneity and differentiation (Campa and Goldberg, 2005; Frey and Manera, 2007; Ghosh and Rajan, 2006).

The effect of changes in import prices on domestic prices is central to applied trade policy analysis; however, it has shown that in some periods, price increases are more rapid and fully transmitted than price decreases and this is reverse in other periods and places (Aguiar and Santana, 2002; Goodwin and Harper, 2000). It was examined how to price transfer from a farm to retail for four dairy products butter, cheese, raw milk and ice cream in the United States. The results showed that the increase in farm prices than to reduce in farm prices is transferred the faster and more complete with retail level, and price transmission has been made asymmetric (Campa and Goldberg, 2005; Guillen and Franquesa, 2007; Hansen, 1994). It showed that prices of the dairy products in the Brazil processing industries are transferred from the farm to retail faster than from retail to the farm (Goodwin and Harper, 2000; Hildreth and Jarrett, 1995). It came to the conclusion that the price transfer of beef and pork is asymmetric (Houck, 1997; Husseini and Nikokar, 2006). It reviews symmetry Price's test for the product of raw milk and the two percent fat milk in seven states of United States. Their results were used as evidence of price asymmetric transmission (Husseini and Dowrandish, 2007; Margarido and Lima, 2009). It came to the conclusion that reducing prices over the on farm, is transmitted faster and more complete in the price transfer of fresh vegetables (Moghadasi and Ardekani, 2007).

Iranian background

It examines price transfer of chicken in Iran from producing to consuming the years 1984 until 2006. It came to the conclusion that any increase in the producing price of chicken meat is transmitted thoroughly to retail, while finality transfer is not complete with the retail level (Moghadasi and Fazeli, 2007; Mundlak and Larson, 1992). During the third Five-Year Development Plan (1984 to 2006), the Iranian government undertook various economic initiatives, such as removing non-tariff barriers, in order to prepare the conditions for the country to join the global trade system, and to accelerate its development efforts to reduce the level of poverty. Generally speaking, the Iranian government policy interventions in food markets are directed toward ensuring domestic food security and lowering food prices through trade policies and rising staple imports supported by crude oil price climbing as well as fiscal and monetary policy, etc.

Furthermore, Iran attempts to manage food price rises through subsidies and supplying discounted staple foods through a coupon system (Negassa and Myers, 2007). It studies the price transfer of meat and chicken market in Iran. Their study confirmed that the level of producer price fluctuation is transferred symmetrical shape to the retail level (Rapsomanikis et al., 2003; Staatz et al., 2008; Schnepf, 2008). As described by the World Bank (2009) report, each policy is expected to have different effects on various groups of households and could depress incentives to farmers to increase output resulting in further increases in food prices. On the other hand, policies such as export bans or high export tariffs taken by the exporter partners may create harmful effects on Iran as a net food importer (The World Bank, 2009). The preferred rate was applied to import of essential goods, a fixed or export rate (3000 Rial for $1) was applied to capital good imports of public enterprises and a variable market rate was devoted to other imports. Such a multi exchange rate system had generated implicit subsidies for state owned enterprises and revolutionary foundations as well as for importers of basic commodities (Alizadeh, 2003). It was studied market price in the dates and the pistachios (Moghadasi and Fazeli, 2007). It was reviewed price transmission model of Iranian pistachio in the global market (Husseini and Dowrandish, 2007).

RESEARCH METHODOLOGY

In this paper, the retail price ($\Pr$) has been used and on farm prices (Pf), of rice a week over a period of twenty five years. The statistics have been prepared from the Central Bank of Islamic Republic of Iran. Consumption price index (CPI) is used to remove inflation producer. In this paper, price transmission has been analyzed, elasticity of transmission prices and causality relationship between the two levels of wholesale prices and retail sales for two types of rice product (grades A and B). The unit root and the Dickey-Fuller tests were used for reviewing stationary of data (as time series), if time series' data are static, it will be used as the Houck model, and If time series' data are non-static, first up through the Johansson test is used for reviewing the relationship between market variables at different levels, then if it converges, it will be the error correction model for analysis of price transmission. The Granger causality test was used for the impressionability of prices. The Houck model is calculated by Formula 1 as follows:

$$\Pr_t - \Pr_0 = \alpha_0 t + \alpha_1 \sum_{i=0}^{M_1} \Delta Pf^{+}_{t-i} + \alpha_2 \sum_{i=0}^{M_2} \Delta Pf^{-}_{t-i} + e_1 \quad (1)$$

Where:

$\Pr$: Logarithm of the retail price; Pf: Logarithm of the on farm prices; ΔPf^{+}: Increase in the on farm prices; ΔPf^{-}: A reduction in the on farm prices; M_1, M_2: Length of interruption.

To investigate symmetric or asymmetric in the positive and negative shocks of price transfer between two levels of market, it uses the equity hypothesis test of variable coefficients. Coefficients α_1 and α_2 are respectively increasing and decreasing effect farm prices on the retail prices. The null hypothesis is defined by Formula 2.

Table 1. The basic statistics of the first-differenced price variables.

Parameter	FP1	FP2	RP1	RP2
Mean	0.0007	0.0006	0.003	0.006
Standard deviation	0.039	0.042	0.022	0.024
Skewness	-0.2	-0.6	-0.4	-0.6
Kurtosis	8.564	5.234	12.321	5.067
Observations	302	302	302	302

Variables are all in natural logarithms. Variable FP1 the farm price per kilo of A rice, FP2 the farm price per kilo of B rice, RP1 is the retail price per kilo of A rice, and RP2 is the retail price per kilo of B rice.

$$H_0 : \sum_{i=0}^{M_1} \alpha_{1i} = \sum_{i=0}^{M_2} \alpha_{2i} \quad (2)$$

The above equation can be easily estimated with OLS.

Whereas α_1 with α_2 are equal and both are positive, then price transfer is symmetrical and otherwise to be asymmetrical. In order to test rejection or acceptance of null hypothesis the Wald test is used. Granger and Lee, error correction models proposed as Formulas 3 and 4.

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

$$ECT_{t-1} = P_{rt-1} - \alpha_0 - \alpha_1 P_{ft-1} \quad (4)$$

In the aforestated regression, it reviews change in retail prices to changes in wholesale prices at time t and wholesale prices in prior periods.

Coefficients B_2^{-} and B_2^{+} show respectively, adjustment of the retail price to positive and negative shocks in marketing margin. Null hypothesis to this species is defined as Formula 5.

$$H_0 : B_2^{+} = B_2^{-} \quad (5)$$

Acceptance of the null hypothesis indicates symmetry of the price transmission and its denial represents asymmetric pric transmission. In this study, it reviews causality between retail and wholesale market, that ultimately it shows the market effect of the two different levels. In other words, though the causality test can determine which market effects on price and its changes in other markets. Granger's causality test is expressed as Formulas 6 and 7.

$$\mathrm{Pw}_t = \sum \alpha_i \mathrm{Pw}_{t-i} + \sum \beta_j \mathrm{Pr}_{t-j} + \mathrm{U}_{1t} \qquad i, j = 1, 2, ..., n \quad (6)$$

$$\mathrm{Pr}_t = \sum \lambda_i \mathrm{Pr}_{t-i} + \sum \delta_j \mathrm{Pw}_{t-j} + \mathrm{U}_{2t} \qquad i, j = 1, 2, ..., m \quad (7)$$

If disruption components are non-correlative, there are 4 modes in the following separation:

1) If ($\sum \beta_j = 0$) and ($\sum \delta_j = 0$), then unilateral causality will form the Pr to Pw, therefore wholesale in the retail level effects on price in the wholesale level.

2) If ($\sum \beta_j = 0$) and ($\sum \delta_j \neq 0$), then unilateral causality will form the Pw to Pr, therefore, wholesale market creates by price changes in the retail market.

3) If the total coefficients of Pw and Pr in regression were statistically significant and non-zero, then they have two-way causality and both markets influence each other.

4) If the total coefficients of Pw and Pr in regression were not statistically significant, and both markets are independent.

RESULT ANALYSIS

The variables in this model are the on farm and the retail prices of the, A and the B rice, the two main varieties grown in Iran. The data come from the council of agriculture, and consist of monthly price data from January 1981 to March 2006, a total of 302 observations. Table 1 reports the basic statistics of the returns of logarithmic farm and retail prices. The means of the two variables indicates that the fluctuation of the retail price is larger than that of the on farm price. These two phenomena imply that there is the marketing margin (or transaction cost) between the on farm and retail prices. The standard deviations could evaluate the risk of the rice prices. The numbers of Table 1 indicate that the farm price is riskier than the retail price is, which indicates that the rice market that Iranian farmers face is a low-return and high-risk one. The skewness coefficient indicates that the distribution of the on farm price is skewed on the left and the distribution of the retail price is skewed on the right. The kurtosis coefficient indicates that the distributions of the four time series are not comparable. When conducting the tests, we first applied two unit root tests: the augmented Dickey-Fuller and the Phillips-Perron tests, to establish that the variables were not stationary. The unit root tests compare constant and time-trend models. They indicate that the four price series are I(1) processes, that is the first difference of the four

Table 2. Test of causality between wholesale and retail level of A rice (grade 1).

Causality test	Status	Wald test	Null hypothesis	Variables
Causality rejects from retail to wholesale market	accept	F=.0067 Probability = .868	$\sum \beta_j = 0$	Pw , Pr (1 , 1) $Pr \rightarrow Pw$
Causality accepts from wholesale to retail market	reject	F= 14.59 ** Probability = .0009	$\sum \delta_j = 0$	Pr , Pw (1 , 1) $Pw \rightarrow Pr$

series are stationary.

Using these results, we can test for co-integration between the on farm and the retail rice prices. The parameter value of A shows that for both varieties, there exists a fixed mark-up effect; the value of B shows that the cross-elasticity between the farm and the retail prices is higher than 1 for both varieties. This implies that variations in the retail price of both varieties of rice are larger than the variations in the on farm price. The cross-elasticity is higher for the A than for the B rice, meaning that the retail price response to changes in the farm price is greater for the A than for the B rice. It is used the unit root test for stationary of variables. Granger causality test is used to examine the relationship of prices. First, the optimum interval is determined for each variable at any price based on the lowest statistic, for this purpose, the cost variable of each product at every level is regressed to their values interval separately and the optimum interval for the variable has been determined. Then the desired equation is regressed to other variables in different intervals, the optimum interval for the variable has been determined. After determining the optimal interval variables, the equations are examined to estimate and the causality test is reviewed by the Wald test and the results are shown in Tables 2 to 4. Table 2 shows results of causality test between the two levels of retail, and wholesale A rice (grade 1). According to the Wald test, null hypothesis accepts in significant level, therefore it is rejected causality form the wholesale to retail market and prices in retail level are not affected by prices on wholesale level. But in the second equation, the null hypothesis is rejected; therefore it is accepted causality form the wholesale to retail market and prices in retail level is affected on prices in wholesale level. Therefore, there is causality communication from wholesale to retail in the A rice, the A rice (grade 1) price in retail market influence the wholesale level market. Table 3 shows results of causality test between the two levels of retail and wholesale of B rice (grade 2). According to Wald test, null hypothesis is accepted in both equations, therefore there is no causality relation between the two markets (wholesale market and retail market), and price in the two markets have independent behaviors.

DISCUSSION

The summary of the empirical results presented in Table 2 shows causality communication from wholesale to retail in the A rice (grade 1), Table 3 shows the same for the B rice (grade 2), the A rice price in retail market influences the wholesale level market, therefore there is not any causality relation between the two markets (wholesale market and retail market), and price in the two markets has independent behaviors. Considering all the variables to be static, so the Houck model for reviewing symmetry of price transmission at two levels of retail and wholesale. For this purpose, the first optimum interval of variables is determined in this model and then it estimated the model, estimation results shown in Table 4. The short-term coefficients show increase or decrease of price in

Table 3. Causality test between wholesale and retail market in B rice product (grade 2).

Causality test	Status	Wald test	Null hypothesis	Variables
Causality rejects from retail to wholesale market	accept	F=.543 Probability = .312	$\sum \beta_j = 0$	Pw , Pr (2 , 3) $Pr \rightarrow Pw$
Causality rejects from wholesale to retail market	accept	F= 819 ** Probability = .423	$\sum \delta_j = 0$	Pr , Pw (3 , 4) $Pw \rightarrow Pr$

Table 4. Results of Houck model and Wald test to review symmetry of price transmission

Variable	Short term coefficients of price changes		Long term coefficients of price changes		Wald test	Null hypothesis	Symmetry of price transmission
	Increase	Reduce	Increase	Reduce			
Price of rice Grade 1	0.76	0.12	-	0.65	F = 16.32 Probability = 0.002	Reject	Asymmetric
Price of rice					F = 21.88	Reject	Asymmetric

wholesale on price changes in the retail level in the same period, and the long-term coefficients show price transfer with interval between these two levels of market. According to Table 4, in any grade of rice, the transmission speed of price increase or positive shock of price is faster than the transmission speed of price reduce or negative shock of price in wholesale market to the retail market.

So a positive shock of price in wholesale is transferred immediately and in the same period to the retail level for grade 1 of rice, while reducing cost is transferred with a delay and after a transition period. The reason is that retailers seek to make more profit and wholesale reacts to price reduction at the retail level. Thus, it concludes that transmission of positive and negative shocks from wholesale to retail are asymmetric and these results are confirmed by Wald test. According to Table 4, it rejects null hypothesis in equity at total coefficients of price increase in different intervals with total coefficients of price reduction for each product with regards to the significance of the F statistics. Therefore, price transmission in the rice market is asymmetric.

Finally, the difference in the threshold values suggests that there is a difference in the timing of government interventions in the markets for the A (threshold 0.081) and the B (threshold 0.054) rice. This may be because

the long-run cross elasticity for the A rice is greater than that of the B rice. This means that a higher transaction cost threshold for the intervention is acceptable for the A rice, when the objective is to avoid excessive movements in the retail price of rice.

Conclusions

The purpose of this study is to examine the relationship between the on farm and the retail prices in the Iranian rice market. We established three hypotheses and obtained several important empirical findings. Firstly, there is a long-run co-integration relationship between the on farm and the retail prices. Secondly, the marketing margin resulting from this long-run relationship may cause short-run dynamic adjustments between the on farm and the retail prices, which results in the asymmetric causality. This implies that the marketing margin is an important factor when analyzing the causality in the on farm and the retail markets. Because of this, we constructed a nonlinear threshold model to fully understand the effect of the marketing margin. Thirdly, when the marketing margin is low, the market operates freely; when the marketing margin is high, the government makes necessary interventions in the market to prevent excessive rises in the rice prices.

When intervention occurs, the market system no longer operates. The main advantage of our model is that it is able to analyze the asymmetric price transmission between the price series without the addition of the transaction cost data (for example, operating costs for intermediary companies). Additionally, the new findings of this paper can allow the government to make appropriate decisions on market interventions and can be used by consumers to determine a reasonable price range for rice, which serves the interests of both farmers and consumers. Finally, employing different empirical models, adopting various rice prices, or including government policies in the model could serve as the possible future research directions for us.

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