

# Spillover Effects of Agricultural Products Price Volatilities in Iran (Case Study: Poultry Market)

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## ABSTRACT

This paper investigates volatility spillover effects across input prices, producer and retail levels in poultry market using the Generalized Autoregressive Conditional Hetroscedasitic (GARCH) models for the period between 1997 and 2010. The empirical findings showed that the volatility of both agricultural input and retail food prices exerts significant, positive spillover effects on the volatility of agricultural output prices. Moreover, the volatility of agricultural output prices has a significant, positive impact on its own volatility. Agricultural output prices are shown to be more volatile than agricultural input and retail food prices. So it is suggested that in regulating of poultry meat market, special attention must be paid to price volatility in related input markets (chicken, corn ...) **KEYWORDS**: Agricultural prices, Volatility, GARCH process, JEL classification: Q11, Q13

## 1. INTRODUCTION

The linkages between agricultural input prices, agricultural output prices and retail food prices are of considerable economic interest. As agricultural inputs are transformed into raw food products and raw food products are processed, along with packaging and other services, into final food products, knowledge about the relationships among input, output and retail food prices is important for many contemporary policy and commodity market analyses. It provides useful information in relation to, for example, pricing efficiency, assimilation of market signals and structural rigidities of prices. Various studies on price linkages in international agricultural commodity markets have emphasized the dynamic transmission of farm-level prices to final consumer prices (e.g. Goodwin and Holt, 1999; Bettendorf and Verboven, 2000). These studies have generally used a time-series framework to examine the extent of price transmission through the production, processing and marketing system.

Another important issue of agricultural pricing relationships is the degree of price volatility of agricultural input, agricultural output and retail food markets. Price volatility indicates the range within which prices might vary in the future (Weaver and Natcher, 2000).

An increase in price volatility implies greater uncertainty about future prices because the range in which prices might lie in the future becomes wider. (Binswanger and Rosenzweig, 1986; Saha and Delgado, 1989).

As a result, producers and consumers can be affected by increased price volatility because it augments the uncertainty and the risk in the market. More specifically, increased price volatility can reduce the accuracy of producers' and consumers' forecasts of future agricultural commodity prices, thereby causing welfare losses to both producers and consumers of agricultural commodities. (Binswanger and Rosenzweig, 1986; Saha and Delgado, 1989).

The paper examines the relative uncertainty of prices in the agricultural input, agricultural output and retail food markets, as well as the degree by which price uncertainty in one market affects price uncertainty in the others. The information we seek is potentially important because, first, it can affect the ability of farmers to forecast prices, and, second, it can help decision makers not only to formulate income and farm price programs but also to establish appropriate hedging strategies, particularly in the case where the volatility of agricultural output prices is found to be sensitive to changes in the volatility of agricultural input and retail food prices. This sensitivity is to be expected, provided there is no contracting in agricultural product markets, because of the biological nature of the production process of agricultural products and the lower price elasticity of farm-level demand than that of retail demand.

\*Corresponding Author: Nasser Mousavi, Department of Humanity, Bilesavar Branch, Islamic Azad University, Bilesavar, Iran. Email: mosavi\_naser@yahoo.com Investigation of spillover effects of price volatilities has not given much attention in Iran, but various studies have been conducted in foreign countries.

Apergis and Rezitis (2003) investigated volatility spillover effects across agricultural input prices, agricultural output prices and retail food prices using the technique of GARCH models. The empirical findings showed that the volatility of both agricultural input and retail food prices exerts significant, positive spillover effects on the volatility of agricultural output prices. Moreover, the volatility of agricultural output prices has a significant, positive impact on its own volatility.

Rezitis (2003) investigated volatility spillover effects across consumer meat prices for lamb, beef, pork, and poultry. The empirical analysis used the methodology of GARCH approach. The empirical results supported the presence of significant effects across the four meat categories under consideration.

Buguk et al., (2003) investigated price volatility spillovers in the U.S. catfish supply chain based on monthly price data from 1980 through 2000 for catfish feed, its ingredients, and farm- and wholesale-level catfish. The exponential generalized autoregressive conditional hetroscedasticity (EGARCH) model was used to test volatility spillovers for prices in the supply chain. Strong price volatility spillover from feeding material (corn, soybeans, and menhaden) to catfish feed and farm- and wholesale-level catfish prices was detected.

Trujillo-Barrera et al., (2011) analyzed volatility spillovers from energy to agricultural markets in the U.S. which have increased due to strong crude oil price volatility and the large growth in ethanol production in the period 2006-2011. Results suggested that spillovers from crude oil to corn and ethanol market are similar in magnitude over time, and were particularly significant during periods of high turbulence in the crude oil market volatility spillovers between corn and ethanol also exist, but primary from the corn to ethanol market.

Alom et al., (2010) studied assesses the mean and volatility spillover effects of changes in food prices among a number of Asian and Pacific countries -Australia, New Zealand, Korea, Singapore, Hong Kong, Taiwan, India and Thailand - including the USA as a special case using daily observations for 1995 to 2010. Employing an empirical multivariate-TGARCH model, this study reveals that while there is weak evidence of own and cross country mean return spillover effects among the selected food markets with strong evidence of mean spillover effects from the USA food price returns to all other markets, with respect to volatility spillovers there are considerable own and cross country effects and these effects are highly persistent and are non linear.

Eliana and Davis (2011) examined the patterns and underlying causes of excessive price volatility for two major soft commodities of critical importance to many of the poorest Commodity Dependent Developing Countries (CDDCs): coffee and cocoa. It aims to identify interactions, similarities and causalities between coffee and cocoa prices on the one hand and, oil and futures prices on the other hand. Analysis of coffee and cocoa historical prices showed that, coffee price volatility has uneven or differing reactions depending on the nature of the market shock. Oil price spillover effects on coffee and cocoa markets are also assessed using cointegration and causality models. Long-run causality is found between oil prices, and coffee and cocoa prices but, only cocoa has an equilibrium relationship with oil in the long term.

Liu Wei (2009) analyzed Daily futures data of hard wheat, cotton, soybean and corn from commodity exchanges of America Chicago Board of Trade (CBOT), Zhengzhou Commodity Exchange (CZCE) and Dalian Commodity Exchange (DCE). First, the cointegration test and Granger causality test are used to study the integration relationship between Chicago and Chinese futures markets. Then, multivariate GARCH (MGARCH) model is used to analyze the risk spillover effect of price volatility between them. At last, the results of the analysis are given.

Liv and Lee (2012) analyzed the spillover effects of supply side inflationary pressure, and the cause and influence of increasing inflation volatility. The spillover effects transferring the supply side pressure to demand side could differ depending on individual products.oil products can affect core inflation for about three to four quarter. In contrast agricultural products could barely influence core inflation. Livestock and fishery products could increase the prices of industrial products and service in the short- term; however, the persistency of this effect is week.

Singh et al. (2011) analyzed the time-varying volatility in crude oil, heating oil, and natural gas futures markets by incorporating changes in important macroeconomic variables and major political and weather-related events into the conditional variance equations. They allowed asymmetric responses to random disturbances in each market as well as to good and bad economic news in the overall economy. They investigated whether there are spillover effects among these energy markets. A bi-directional volatility spillover effect is found between heating oil and natural gas markets. Among the macro variables considered the spread between the 10-year and 2-year Treasury constant maturity rate is found to have a positive relationship between the volatilities of all commodities. The events that had a major impact on the volatilities of energy commodities include the September 11<sup>th</sup> terrorist attacks, hurricane Katrina, and the 2008 U.S. financial crisis.

In this paper, the approach to analyzing volatility spillovers pioneered by Engle et al., (1990) was followed. The statistical technique adopted here to measure agricultural price volatility is that of Generalized Autoregressive Conditional Heteroscedastic (GARCH) models, introduced by Bollerslev (1986), which has been mainly used to study certain volatility features for stock and exchange rate data. Chou (1988) argued in favor of GARCH models on the grounds that they were capable of capturing various dynamic structures of conditional variance, of incorporating heteroscedasticity into the estimation procedure, and of allowing simultaneous estimation of several parameters under examination.

#### 2. METHODOLOGY

In the current research, Generalized Autoregressive Conditional Hetroscedasitic (GARCH) model was used to investigate the volatility spillover effects in poultry market. First, Static test for the three time series (index of input price, index of producer price, and index of consumer price) and in the case of being non-static, assuming the other conditions being present, convergence test and estimating error correction model and effects of volatility spillover will be considered.

#### **2-1. STATIC TEST OF VARIABLES**

Using the ordinary and classic methods of econometrics is not efficient and valid in time-series data when the variables are non-static and statistics of F and T tests are not valid as well. To solve this problem, the most important matter in time series is how to investigate the stagnation of the variables. To deal with this problem various tests have been suggested that each of them have its own specific features and advantages (Gujarati, D, 2003). A test that has been frequently used for this purpose is the *unit root test* which itself includes some other tests, such as Augmented Dickey–Fuller (ADF), Phillips -Perron (PP)<sup>-</sup> Kwiatkowski, Phillips, Schmidt and Shin (KPSS) and Elliot-Rothenberg -Stock point optimal (ERS) to investigate the stagnation. Since ADF and PP tests have been widely dealt with in economic studies, the KPSS and ERS tests will be discussed below:

#### 2-1-1-THE KWIATKOWSKI, PHILLIPS, SCHMIDT, AND SHIN (KPSS) TEST

The KPSS (1992) test differs from the other unit root tests described here in that the series  $Y_t$  is assumed to be (trend-) stationary under the null. The KPSS statistic is based on the residuals from the OLS regression of  $Y_t$  on the exogenous variables  $X_t$ :

$$y_{t} = x_{t}^{\prime} \delta + U_{t}$$
(1)  
The LM statistic is defined as:  

$$LM = \sum_{t} S_{(t)^{2}} / (T^{2} f_{0})$$
(2)

Where  $f_0$ , is an estimator of the residual spectrum at frequency zero and where  $S_{(t)}$  is a cumulative residual function:

$$S_{(t)} = \sum_{r=1}^{t} \hat{U}_r$$
(3)

Based on the residuals  $\hat{U}_t = y_t - x'_t \hat{\delta}(0)$ . We point out that the estimator of  $\delta$  used in this calculation differs from the estimator for  $\delta$  used by GLS detrending since it is based on a regression involving the original data and not on the quasi-differenced data.

To specify the KPSS test, you must specify the set of exogenous regressors  $X_t$  and a method for estimating  $f_0$ .

### 2-1-2- ELLIOT, ROTHENBERG, AND STOCK POINT OPTIMAL (ERS) TEST

The ERS Point Optimal test is based on the quasi-differencing regression defined in Equations  $d(y_t|a) = d(x_t|a)'\delta(a) + \eta_t$ (4) Define the residuals from (4) as  $\hat{\eta}_{t}(a) = d(y_{t}|a) - d(x_{t}|a)'\hat{\delta}(a)$ , and let  $SSR(a) = \sum \hat{\eta}_{t}^{2}(a)$  be the sum-of-squared residuals function. The ERS (feasible) point optimal test statistic of the null that  $\alpha = 1$  against the alternative that  $\alpha = \overline{\alpha}$ , is then defined as:

(5)

$$P_T = (SSR(\overline{a}) - \overline{a}SSR(1)) / f_0$$

Where  $f_0$ , is an estimator of the residual spectrum at frequency zero.

To compute the ERS test, must specify the set of exogenous regressors  $x_t$  and a method for estimating  $f_0$ 

# 2.3. CONDITIONAL VOLATILITY ESTIMATES: SPILLOVERS AMONG INPUT, PRODUCER AND RETAIL PRICES

MVGARCH models, developed by Bollerslev (1986), are considered as a parsimonious special case of an ARMA process applied to the squared stochastic error term (Tsay, 1987).

$$\Delta P_{t}^{i} = a_{1} + \sum_{i} f_{1i} \Delta p_{t-i}^{i} + \sum_{i} f_{2i} \Delta p_{t-i}^{o} + \sum_{i} f_{3i} \Delta p_{t-i}^{r} + \varphi_{1} e c_{t-1} + e_{t}^{i}$$
(6)

$$\Delta P_{t}^{o} = a_{2} + \sum_{i} f_{4i} \Delta p_{t-i}^{i} + \sum_{i} f_{5i} \Delta p_{t-i}^{o} + \sum_{i} f_{6i} \Delta p_{t-i}^{r} + \varphi_{2} e c_{t-1} + e_{t}^{o}$$
(7)

$$\Delta P_{t}^{r} = a_{3} + \sum_{i} f 7_{7i} \Delta p_{t-i}^{i} + \sum_{i} f_{8i} \Delta p_{t-i}^{o} + \sum_{i} f_{9i} \Delta p_{t-i}^{r} + \varphi_{3} e c_{t-1} + e_{t}^{r}$$
(8)

$$h_{t}^{i} = b_{1} + b_{2}e_{t-1}^{i^{2}} + b_{3}h_{t-1}^{i} + b_{4}e_{t-1}^{o^{2}} + b_{5}e_{t-1}^{r^{2}} + b_{6}h_{t}^{o} + b_{7}h_{t}^{r}$$
(9)

$$h_t^o = b_8 + b_9 e_{t-1}^{o^{-2}} + b_{10} h_{t-1}^o + b_{11} e_{t-1}^{i^{-2}} + b_{12} e_{t-1}^{r^{-2}} + b_{13} h_t^i + b_{14} h_t^r$$
(10)

$$h_{t}^{r} = b_{15} + b_{16}e_{t-1}^{r^{2}} + b_{17}h_{t-1}^{r} + b_{18}e_{t-1}^{o^{2}} + b_{19}e_{t-1}^{i^{2}} + b_{20}h_{t}^{o} + b_{21}h_{t}^{i}$$
(11)

Where  $\Delta P^i$ ,  $\Delta P^o$  and  $\Delta P^r$  are the first differences in logarithms of agricultural input, agricultural output and retail food prices, respectively,  $ec_{t-1}$  is the lagged value of the error correction term derived from the long-run cointegrating vector (1), and  $e^i$ ,  $e^o$  and  $e^r$  are stochastic disturbance terms of the mean process for input, output and retail prices, respectively. Finally,  $h^i$ ,  $h^o$  and  $h^r$  are the conditional variances of agricultural input, agricultural output and retail food prices, respectively. Focusing, for example, on the  $h^i$  equation, the coefficients  $b_3$ ,  $b_6$  and  $b_7$  captures spillover effects from input, output and retail prices. By contrast, the coefficients  $b_4$  and  $b_5$  capture volatility spillover effects from output and retail prices to the input prices. The sum  $b_2 + b_3 + b_4 + b_5 + b_6 + b_7$ measures persistence (Engle and Bollerslev, 1986; Engle et al., 1990). If it is less than one but very close to one, then the MVGARCH model is characterized by large persistence, i.e. the shocks are persistent in the sense that they remain important for forecasts of all horizons.

#### **3. RESULTS AND DISCUSSION**

This paper investigates volatility spillover effects across input prices, producer and retail levels in poultry market using the Generalized Autoregressive Conditional Heteroscedasitic (GARCH) models Monthly data on agricultural input prices ( $p^i$ ), producer prices ( $p^o$ ) and retail prices ( $p^r$ ) of poultry market in Iran for the period between 1997 and 2010 were obtained from State Livestock Affairs Logistic (SLAL) data base. Figure 1 shows the changes of poultry monthly prices in Iran between 1997 and 2010.



Figure 1.Input, producer and retail poultry prices between 1997 and 2010

We first tested nonstationarity by using unit root tests proposed by Augmented Dickey–Fuller (ADF), Phillips -Perron (PP) Kwiatkowski, Phillips, Schmidt and Shin (KPSS) and Elliot-Rothenberg -Stock point optimal (ERS). The results are reported in Table 1.

LP<sup>i</sup>, LP<sup>o</sup>, and LP<sup>r</sup> are logs of input prices, producer prices and retail prices in poultry market respectively.

The hypothesis that the variables  $LP^i$ ,  $LP^o$  and  $LP^r$  contain a unit root could not be rejected at the 5 per cent significance level. When first differences were used, unit root nonstationarity was rejected at the 5 per cent significance level, suggesting that the variables  $LP^i$ ,  $LP^o$  and  $LP^r$  are I (1) variables. This result leaves open the possibility of cointegration among the variables  $LP^i$ ,  $LP^o$  and  $LP^r$ .

Table 1. Unit root tests results								
Variables	1	ADF	РР		ERS		KPSS	
	Levels	First- differences	Levels	First- differences	Levels	First- differences	Levels	First- differences
LP <sup>i</sup>	-1.32	-11.93***	-1.85	-20.60***	65.80	0.0003***	1.56***	0.14
LP°	-0.57	-4.99***	-1.62	-20.01***	8.55	1.12***	0.13***	1.57
LP <sup>r</sup>	-2.47	-10.36***	-3.00	-14.90***	7.58	$0.77^{***}$	$0.27^{***}$	0.10

Table 1.Unit root tests results

\*\* Significant at the 5 per cent level

Once having identified a set of three jointly dependent stochastic variables integrated of the same order, i.e. I (1), a vector auto regression (VAR) model was postulated to obtain a long-run relationship. Next, Sims' (1980) likely-hood ratio (LR) tests, corrected for the degrees of freedom, were used to specify the number of lags in the VAR system.

Next, tests developed by Johansen and Juselius (1990) provided evidence in favor of cointegration. The results are reported in Table 2:

Table	2.Estimates	of coi	ntegration	Test in	Johansen	's model
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The	maximum Eigen v	alue	trace statistic			
Null hypothesis	$\lambda_{trace}$ value	Critical values at 0.05	Null hypothesis	$\lambda_{ m max}$ value	Critical values at .05	
Nonexistence of long-term relationship	45.05**	29.79	Nonexistence of long-term relationship	30.37**	21.23	
More than one long-term relationship	14.64	15.49	More than one long-term relationship	13.94	14.26	
More than two long-term relationships	0.73	3.84	More than two long-term relationships	0.73	3.84	

\*\* Significant at the 5 per cent level

Both the maximum Eigen value test statistic  $(\lambda_{max})$  and the trace test statistic  $\lambda_{trace}$  indicate the existence of a single long-run relationship between the logarithms of input  $(Lp^i)$ , producer  $(Lp^o)$  and retail prices  $(Lp^r)$ .Critical values were provided with intercepts and unrestricted trends.

Normalizing with respect to the coefficient of  $Lp^{i}$ , the co-integrating vector takes the following form:

# $Lp^{i} = 0.536Lp^{o} + 0.306Lp^{r}$

(0.063) (0.093)

(12)

Numbers in parentheses denote standard errors.

The estimated equation (12) describes a steady state (long-run equilibrium) among the three prices under study, after allowing all the adjustments to take place. Thus, all three prices under study were moving together in the long run.

The estimated coefficients indicate elasticity among the three price indices. Thus, a 1 per cent increase (decrease) in producer prices is expected to lead to higher (lower) input prices by 0.54 per cent, whereas a 1 per cent increase (decrease) in retail prices is expected to lead to higher (lower) input prices by 0.31 per cent.

Once the presence of a cointegration relationship had been established between  $Lp^i$ ,  $Lp^o$  and  $Lp^r$ , the associated error correction vector autoregressive (ECVAR) mechanism, which describes the short-run dynamics, was estimated. Results are presented in Table 3. Once again, Sims' (1980) likelihood ratio (LR) tests, corrected for the degrees of freedom, were used to specify the number of lags in the ECVAR system. The LR test statistic selected a six-lag ECVAR. The ECVAR model proxied the mean equations for the GARCH process. It should be noted that all estimates with t-statistics less than 2.00 have been omitted.

In addition, the estimated equations satisfy certain econometric criteria, namely, absence of serial correlation (LM), absence of functional misspecification (RESET) and absence of heteroscedasticity (HE).

Table 3. Estimates of the ECVAR model						
Coefficients	$\Delta p^i$	$\Delta p^{o}$	$\Delta p^{r}$			
$\Delta p_{t-1}^{i}$	0.07**	0.61**	0.14**			
$\Delta p_{t-2}^{i}$	-0.16**	0.03**	0.017**			
$\Delta p_{t-1}^{\circ}$	0.43**	0.17**	0.18***			
$\Delta p_{t-2}^{o}$	0.25**	0.0009**	-0.031**			
$\Delta p_{t-1}^r$	0.31**	0.18**	0.03**			
$\Delta p_{t-2}^r$	-0.28**	-0.36**	-0.29**			
С	$0.009^{**}$	0.009**	0.012**			
ec <sub>t-1</sub>	-0.87**	-0.81**	-0.101**			

\*\*\* Significant at the 5 per cent level

 $\Delta p^{i}$ ,  $\Delta p^{o}$  and  $\Delta p^{r}$  are the first differences in logarithm of input prices, producer and retail levels in poultry market.

The error-correction coefficients are all negative and statistically significant. The empirical results of the MVGARCH model are reported in Table 4.

A Box–Jenkins selection procedure indicated that a MVGARCH (1,1) model for relative poultry prices exhibited the best fit.

	Conditional mean equations						
Coefficients	$\Delta p^i$		$\Delta p^{o}$		$\Delta p^{r}$		
С	0.012**		0.0139**		0.011**		
$\Delta p_{t-1}^{i}$	0.540**		0.045**		0.175**		
$\Delta p_{t-2}^{i}$	-0.612**		0.426**		0.142**		
$\Delta p_{t-1}^{o}$	0.581**		0.0005**		-0.166**		
$\Delta p_{t-2}^{o}$	0.368**		0.139**		0.181**		
$\Delta p_{t-1}^r$	0.002**	0.064**		0.0201**			
$\Delta p_{t-2}^r$	-0.133**		-0.233**		-0.279**		
		Cond	itional variance equation	s			
	$h^i$		$h^{o}$		$h^r$		
С	$0.014^{**}$	С	0.013**	С	0.0033**		
$e_{t-1}^{i^{2}}$	0.00054**	$e_{t-1}^{o^{-2}}$	0.00069**	$e_{t-1}^{r-2}$	0.00072**		
$h_{t-1}^i$	0.261**	$h^{\scriptscriptstyle O}_{t-1}$	0.871**	$h_{\scriptscriptstyle t-1}^{\scriptscriptstyle r}$	0.336**		
$e_{t-1}^{o^{-2}}$	0.0069**	$e_{t-1}^{i^{2}}$	0.0029**	$e_{t-1}^{i^{-2}}$	0.0009**		
$e_{t-1}^{r^{2}}$	0.00025**	$e_{t-1}^{r-2}$	0.00029**	$e^{o^{-2}}_{t-1}$	0.0006**		
$h_t^o$	$0.680^{**}$	$h_t^i$	1.122**	$h_t^o$	0.309**		
$h_t^r$	0.068**	$h_t^r$	0.066**	$h_t^i$	0.217**		

Table 4.Estimates of the MVGARCH model

\*Significant at the 5 per cent level

The results show that in the  $h^i$  and  $h^r$  equations the volatility spillover coefficients, i.e.  $b_4$ ,  $b_5$ ,  $b_{18}$  and  $b_{19}$ , are positive and statistically significant. However, the magnitude of these coefficients is small, which indicates weak volatility spillovers from the producer and retail markets to the input market, as well as from the producer and input markets to the retail market.

The statistical significance of  $b_3$  and  $b_{17}$  coefficients implies that in the input and retail markets, market-specific volatility clustering also mattered. The persistence measure is low in both the input and retail markets, i.e. 0.338 and 0.262, respectively, and definitely less than one, indicating that the MVGARCH model is stationary for both input and retail prices. In other words, shocks on input or retail prices do not condition the future variance for a long period.

The empirical results for the  $h^{\circ}$  equation (Table 4) show that the magnitude of the volatility spillover coefficients,  $b_{11}$  and  $b_{12}$ , is statistically significant, indicating the presence of strong volatility spillover effects from both the input and the retail markets to the agricultural producer market. It should be noted that the volatility spillover effect from the retail market to the producer market, i.e.,  $b_{12} = 0.0069$ , is stronger than the

volatility spillover effect from the input market to the producer market, i.e.  $b_{11} = 0/0029$ . This indicates that the volatility of output prices was more sensitive to volatility changes in retail prices than to volatility changes in input prices.

This finding supports the notion that 'demand' factors are stronger than 'cost' factors in affecting the volatility of producer prices.

The statistical significance of the  $b_{10}$  coefficient shows again the presence of an effect originating within the producer market. The persistence measure is close to unity, i.e. 0.881, but less than one, indicating that the MVGARCH model is stationary; however, it implies a high degree of volatility persistence. Thus, shocks to producer prices persist for a long time in conditioning the future variance.

#### 4. CONCLUSIONS AND SUGGESTIONS

The empirical findings show that significant and positive effects were imposed by the volatility of both input and retail prices on the volatility of producer prices. Moreover, the results show that the volatility of retail prices had a larger impact than the volatility of input prices had on the volatility of producer prices, indicating that demand-specific factors are stronger than cost factors in affecting the volatility of producer prices. In addition, the volatility of producer prices exerted a positive and statistically significant impact on its own volatility. These findings imply that information generated by both agricultural input and retail food prices leads to changes in the volatility of agricultural output prices.

Based on the empirical results of this paper, the impact of the volatility of both input and retail prices on the volatility of producer prices is potentially important, because it can render producer prices more volatile, augmenting market uncertainty and risk for both consumers and producers of agricultural commodities.

The empirical results show that the response of retail prices (input prices) to the uncertainty of producer prices and input prices (retail prices) was very weak.

The finding that producer prices were more volatile than input and retail prices could be attributed to the lack of contracting in producer markets, to the biological nature of the production process, and to lower price elasticity of producer level demand than that of retail demand.

So it is suggested that in regulating of poultry meat market, special attention must be paid to price volatility in related input markets (chicken, corn ...)

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