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Volatility and Transmission of Shallot Commodity Prices in Indonesia

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ABSTRACT

The shallot commodity has been becoming a strategic issue for the government nowadays because this commodity has contributed to inflation. The price volatility of shallots causes high price disparities between producers and consumers. This situation gives is detrimental more to farmers and consumers than to traders because it provides more opportunities for traders to manipulate information on price, so that price transmission becomes asymmetric. This paper discusses the price transmission of shallots between three players: farmers, wholesalers and retailers. This study used daily data from January 1st 2017 to December 31st 2017 which were analyzed using the ECM-EG method. The wald test results show that shallots commodities showed a price asymmetry in the short term in each marketing chain, namely between producers to wholesalers, wholesalers to retail and retail to producers. Whereas in the long run, the price asymmetry only exist on the wholesale-retail linkage. Meanwhile the transmission of long-term prices between producers to wholesalers, retail to producers in the long-term is symmetrical.

Keywords : Asymmetric Transmission, Shallots, ECM-EG, Farmer-Wholesaler-Retailer Linkage

I. INTRODUCTION

Horticultural commodities are commodities with high economic value (Firdaus 2015), but their development still faces major problem in the off-farm aspect, namely price. Disparity and uncertainty of horticultural commodity prices that occur between producers and consumers has hurt many parties. This is caused by production or harvest failure, speculation which is generally carried out by producers or traders, and weak distribution management. The effect of the weak distribution system has a simultaneous impact that will trigger price volatility (Carolina et al. 2016).

For farmers as producers, price volatility can reduce production and investment in agriculture, and increase the risk of loss in agricultural business. For consumers, price shocks will reduce consumer real income when there is a high price increase. While the broad impact for a country, price volatility can contribute to inflation from non-core volatile food inflation.

Based on Presidential Regulation No. 71 of 2015, there are nine main food commodities that are included in the volatile food group. Among the nine volatile food commodities, one of the horticultural commodities that experienced very high price volatility and was the biggest contributor to non-core inflation is

shallot. Based on data from BPS 2019, contribution of volatile food against inflation in February 2019 reached 59 percent. This share is quite large and needs attention. Volatility of prices on shallots causes marketing margins on these commodities to become large, so prices at the consumer level are high and prices received by farmers are getting lower. Irawan (2007) argues that such a trend occurs because volatile prices open up opportunities for traders to play with prices.

The large price disparity indicates that shallot marketing occurs with an inefficient and ineffective system. This inefficient marketing channel will affect the welfare of producers and consumers. Conforti (2004) explains that this can be caused by two things, namely the long marketing channels and the market power that is in possession of intermediary traders. Both will cause the margin formed in marketing from upstream to downstream (vertical) to be very large and inefficient. Furthermore, Brooker et al (1997) explained that retailers' responses to price increases at wholesale level were faster than their responses to price declines.

Ruslan, Firdaus and Suharno (2015) state that the transmission of shallot prices at the wholesale farmer level is symmetrical both in the short and long term. Whereas at the level of wholesale retailers prices are symmetrical in the short run and asymmetrical in the long run. This happens because of the misuse of market power which is also supported by the demand for shallots that are inelastic at consumer level. It means that wholesale retailers have market power in pricing. The link between market power and price transmission,Vavra and Goodwin (2005) found the behavior of intermediary traders who tried to maintain the level of profit and would not raise/lower prices according to the actual price signal. This condition causes price control on distribution channels and transmission of imperfect prices between producer and consumer levels. Prices are volatile and do not reflect actual market conditions indicating inefficient transmission of prices between marketing institutions, or referred to as asymmetric price transmission.

Several studies have shown that there are problems in price formation that occurs in marketing chains in the market, so that the current market is not considered efficient in carrying out its functions. From the above data presentation, it shows that the shallot marketing system is not efficient. Thus it has become important to analyze the price volatility and transmission of the price of shallots.

II. METHODS AND MATERIAL

This study used secondary data of daily time series data from 1 January 2017 to 31 December 2017 that was obtained from the Ministry of Agriculture and Kramat Jati Main Market, Pasar Induk Kramat Jati (PIKJ). This study utilized the Coefficient of Variation analysis method to see price volatility and the ECM-EG method to see the transmission of shallot prices. Analysis of price transmission was used to see whether there was asymmetry in the prices between institutions involved in the marketing chain (producers, wholesalers and consumers) of shallots. The data used include the average price of shallots at the producer and consumer level in all districts in Indonesia, as well as the price of shallots at the wholesale level from the Kramat Jati Main Market (PIKJ). The Error Correction Model (ECM) is as follows:

When prices of reference market (PA) influences prices of follower markets (PP)

$$\Delta PP_t = \alpha_0 + \sum_{i=1}^{n} \beta_{PP}^{-} \Delta PP_{t-\mathrm{i}}^{-} + \sum_{i=0}^{n} \beta_{PA}^{-} \Delta PA_{t-\mathrm{i}}^{-} + \pi_1 Z_{t-\mathrm{i}}^{-} + \sum_{i=1}^{n} \beta_{PP}^{+} \Delta PP_{t-\mathrm{i}}^{+} + \sum_{i=0}^{n} \beta_{PA}^{+} \Delta PA_{t-\mathrm{i}}^{+} + ect^{+} + ect^{-} + \varepsilon_t$$

Where:

PP_t = Price at t-day market level (Rp/Kg)

PA_t = Price at the market level on the t- (Rp/Kg)

PP_{t-i} = Price at follower market level the previous day (Rp/Kg)

PA_{t-i} = Price at reference market level the previous day (Rp/Kg

α_0 = Interception

i = Lag length

ect = *Error correction term*

ε = *Error term*

III.RESULTS AND DISCUSSION

A. Red Shallot Price Volatility in Indonesia

Price transmission analysis is carried out on the prices of producers, wholesalers and consumers of shallots in Indonesia. For producer and consumer prices, the national price was use, while the wholesale price was approximated by the price in the Kramat Jati Main Market, due to limited data on the national wholesale price. The data used were daily data from 1 January 2017 to 31 December 2017 which was obtained from the Ministry of Agriculture and the Kramat Jati Central Market (PIKJ). Prices at the wholesale level take Kramat Jati Main Market (PIKJ) due to being the largest wholesale center in Indonesia. The following is a descriptive analysis of the coefficient of variaton of shallot prices at the producer, wholesaler and consumer levels during the period January 2017 to December 2017 in Table 1.

Based on the value of CV in Table 1, note that over the period January 2017 to December 201 7, prices of shallot at the level of manufacturers and wholesalers were more varied when compared with the prices in consumer level. The high variation of the price of shallots at the producer and wholesaler level can be seen from the value of the CV. At the producer level, the highest CV reached 17 percent, occurring in April. Whereas at the wholesale level, the largest CV occurred in March by 27 percent.

The CV value at each of these marketing institutions showed that the price of shallots, prices at producer and wholesaler levels change more quickly when compared to prices at the consumer level. Volatility of shallot prices at the producer level is influenced by several factors, among others were its seasonal production patterns that will affect the availability of shallots in certain months, poor storage facilities, as well as by its perishable nature that it is vulnerable to become damaged and rotten as it contains a lot of water.

TABLE I. COEFFICIENT OF VARIATION (CV) VALUES OF SHALLOT PRICES IN FARMERS, WHOLESALERS AND CONSUMERS LEVEL DURING THE PERIOD JANUARY 2017 TO DECEMBER

Month	Shallot		
	Producer	Wholesaler	Consumer
January	8	9	6
February	8	15	6
March	7	27	6
April	17	7	4
May	4	7	4
June	6	8	8
July	5	16	6
August	5	5	7
September	9	10	7
October	12	13	6
November	12	6	7
December	15	12	4

In addition, in the case of shallots, the drying technique used by farmers is drying in the sun which takes between 7 to 9 days. Drying with this technique is certainly very dependent on weather conditions. When the day is sunny the drying can be done well, but on the contrary when the weather is cloudy or even raining, drying can not be done at all and the bulbs of red shallots become rotten quickly. The high price volatility is also often detrimental to farmers rather than to traders because farmers are generally unable to adjust the time of sale to get a more profitable selling price.

Significant changes in prices of shallots at the consumer level can affect the increase in prices of other commodities at the consumer level. It is because shallots are one of the volatile foods that contribute to non core inflation. The price changes can be caused by changes in demand for shallots in accordance with religious holidays. It is shown when the highest CV of shallot occurs in December, which coincides with the approaching New Year and Christmas. In addition, high volatility also occurred in July during the Ramadan. This condition shows that changes in demand have not been responded well in the supply side..

Conversely, better storage conditions at the trader level enable trader to better regulate sales. According Simatupang (1999), the high volatility of prices also provide an opportunity for traders to manipulate information about prices at the farm level. This has caused the transmission rates of the consumer market to the farmers tend to be asymmetric in the sense that an increase in the price of consumer level then is not passed on to the farmers in fast and perfect manner, but the opposite happens if there is a price decline. This has led to differences in volatility of shallot price between producers, wholesalers and retailers.

B. Data Stationary Testing

The first step to analyzing price transmission was to test the stationary of shallot time series data at the producer, wholesaler and retailer level. This test is conducted to see the consistency of changes in the time series data and prevent spurious regression. Data consistency is needed to identify the supposition that the data is non stationary. While spurios regression is a condition in which a regression of one variable to another variable yields high R^2 value but in actuality the variables are not causally related economically. This often happens when the second or more time series data shows the characteristics of a strong trend in a certain period of time.

Data stationary was known after tests to look at in what condition the data is stationary were done a few times. If the data series is stationary without doing differencing, then the data is said to be stationary on the condition of I(0) or level. If the data series is stationary after the first differencing, then the data is said to be stationary in condition I(1) or in first differences or integrated to order 1. In general, if the time series data must be reduced "d" times to be stationary, then the data can be notated in the form I(d) or integrated to order "d". The stationarity testing used augmented Dickey-Fuller test (ADF) with 5 percent significance level. This test is carried out at the level and first difference. If the data is not stationary at the level, then the test will continue at first difference condition. Furthermore, the data series is said to be stationary if the ADF value of t statistics is smaller than the MacKinnon critical value. Stationary test result of shallots prices in

Price	ADF value	
	Level	*First Difference*
Producer	0.767	0.000*
Wholesaler	0.406	0.000*
Retailer	0.678	0.000*

manufacturers, wholesalers, and consumers level on level and first difference condition is shown in Table 2.

TABLE II. DATA STATIONARITY TEST RESULTS

Note: *Stastionary at 5 percent

The stationarity test results shows that the variables producer prices, wholesale prices, and retail prices of shallots were not stationary at level condition. After the first differencing on all variables, the variables were stationary. The presence of non-stationary variables at the level indicates a long-term relationship between variables (cointegration). Therefore, before the price transmission model is formulated, the existence of cointegration between the to be tested variables needs to be identified.

C. Price Cointegration Test

Cointegration is the balance that occurs between the two prices in the long run. The method used in this study was the Johansen cointegration test. Equation testing was determined based on the SC criterion, where the assumption chosen was *intercept* (*no trend*) and the optimum lag length was also based on the SC criteria where the lag used was lag 2. The results of the price cointegration testing between shallot marketing institutions can be seen in table 3.

TABLE III
RESULTS OF ESTIMATED COINTEGRATION BETWEEN PRODUCER, WHOLESALE AND RETAILER PRICES

Commodity	Rank	P→G	G→E	P→E
Shallot	0	0.000*	0.003*	0.000*
	1	0.096	0.087	0.198

Note: *Stationary at 5 percent

In this study, price asymmetry was analyzed using the ECM-EG method developed by Von Cramon-Taubadel and Loy (1996), where asymmetric price transmissions are separated between short-term and long-term transmissions. In this model testing asymmetrical condition is not only done to positive *shock* and negative *shock* of its independent variables but also to the coefficient of ECT^{+} and ECT^{-}. *Error Correction Term* (ECT) was used to measure the deviation of the long-term balance between the two prices. The inclusion of this ECT allows the estimated price to respond to price changes and can also improve the deviation of the long-term balance.

Analysis of commodity prices on the transmission of shallot which was carried out first was the relationships that affect the wholesale price of retail. In the short term, there is no significant wholesale price that affects retail prices. That is, in the short term, the retail price that is formed is not influenced by wholesale prices. However, in the long run it shows that ECT^{+} and ECT^{-} both have significant probability values with coefficients of -0.072 and -0.073, respectively. This significance shows that in the long run, the increase and decrease in the shallot prices at the retail level follows the changes at the wholesale level. The ECT^{+} coefficient indicated that the adjustment time needed for retail prices to fall to reach a balance point was 26 days. While the ECT^{-} coefficient showed that the adjustment time needed for consumer prices to rise to equilibrium is 26 days.

Meanwhile in the relationship between the retail price to the wholesale, in the long term ECT^{+} and ECT^{-} is not significant in both cases, but in the short term, the retail price significantly affects the wholesaler, namely when there is an increase in prices on the previous day (t-1) and when there is a decline in prices on the same day (t). This shows that if there is a change in prices at retail, wholesale prices respond more quickly to price decreases than to price increases. The not significant ECT^{+} and ECT^{-} values showed that in the long run, if wholesale

prices are at the point of imbalance it will not be corrected by wholesale prices.

When producer prices increase or decrease, it will significantly affects retail prices under short period of time, even though the response of the increase is one day faster compared to the response when there is a decrease in price. Increase in producer prices is responded by retail prices at t and t-1 while decreases in price are responded to at t-1 and t- 2. In the long run, only ECT $^{+}$ is significant whereas ECT $^{-}$ is insignificant. That is, in the long run retail prices will only correct price imbalances when the retail price that occurs is above the balance line, but will not adjust prices when the price formed is below the balance line.

Next, the transmission of prices from retail to producers was identified. Producer prices tend to be responsive to changes in retail prices when prices decline rather than when prices increase. The increase in retail prices will also increase producer prices at an immediate time (t), while the signal of falling prices from retail will be responded to by the producer level when t, t-1 and t-2, which means that the decline in retail price will be responded by producer prices on the same day, the day after and two days after the increase at the retail level.

Whereas in the long run, similar to the relationship between producers to retail, only ECT $^{+}$ is significant while ECT $^{-}$ not significant. That is, in the long run producer prices will only correct price imbalances when producer prices occur above the balance line, but will not adjust prices when prices are formed below the balance line.

TABLE IV
ESTIMATION OF ECM-EG MODEL PRICES ON SHALLOT MARKETING CHAIN

Variable	G→E	Variable	E→G	Variable	P→E	Variable	E→P	Variable	G→P
C	-7.207	C	11.919	C	209.827	C	295.133	C	-256.37
	(0.965)		(0.937)		(0.124)		(0.042)		(0.176)
ΔHE_{t-1}^{+}	-0.752	ΔHG_{t-1}^{+}	-0.996	ΔHE_{t-1}^{+}	-0.732	ΔHP_{t-1}^{+}	-0.524	ΔHP_{t-1}^{+}	-0.531
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)
ΔHE_{t-2}^{+}	-0.208	ΔHG_{t-2}^{+}	-0.501	ΔHE_{t-2}^{+}	-0.195	ΔHP_{t-2}^{+}	-0.146	ΔHP_{t-2}^{+}	-0.126
	(0.019)		(0.000)		(0.026)		(0.036)		(0.095)
ΔHE_{t-1}^{-}	-0.762	ΔHG_{t-1}^{-}	-1.007	ΔHE_{t-1}^{-}	-0.827	ΔHP_{t-1}^{-}	-1.292	ΔHP_{t-1}^{-}	-1.253
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)
ΔHE_{t-2}^{-}	-0.665	ΔHG_{t-2}^{-}	-0.381	ΔHE_{t-2}^{-}	-0.664	ΔHP_{t-2}^{-}	-0.676	ΔHP_{t-2}^{-}	-0.666
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)
ΔHG_{t}^{+}	-0.045	ΔHE_{t}^{+}	0.081	ΔHP_{t}^{+}	0.286	ΔHE_{t}^{+}	0.269	ΔHG_{t}^{+}	-0.089
	(0.628)		(0.334)		(0.001)		(0.005)		(0.401)
ΔHG_{t-1}^{+}	-0.049	ΔHE_{t-1}^{+}	0.217	ΔHP_{t-1}^{+}	0.211	ΔHE_{t-1}^{+}	-0.052	ΔHG_{t-1}^{+}	-0.205
	(0.647)		(0.017)		(0.023)		(0.619)		(0.100)
ΔHG_{t-2}^{+}	-0.108	ΔHE_{t-2}^{+}	0.012	ΔHP_{t-2}^{+}	0.070	ΔHE_{t-2}^{+}	-0.091	ΔHG_{t-2}^{+}	-0.101
	(0.274)		(0.882)		(0.312)		(0.334)		(0.373)
ΔHG_{t}^{-}	0.009	ΔHE_{t}^{-}	-0.107	ΔHP_{t}^{-}	0.035	ΔHE_{t}^{-}	0.134	ΔHG_{t}^{-}	0.084

Variable	G→E	Variable	E→G	Variable	P→E	Variable	E→P	Variable	G→P
	(0.923)		(0.194)		(0.674)		(0.163)		(0.459)
ΔHG_{t-1}^{-}	0.075	ΔHE_{t-1}^{-}	0.009	ΔHP_{t-1}^{-}	0.187	ΔHE_{t-1}^{-}	0.305	ΔHG_{t-1}^{-}	0.049
	(0.514)		(0.916)		(0.050)		(0.006)		(0.704)
ΔHG_{t-2}^{-}	0.062	ΔHE_{t-2}^{-}	0.078	ΔHP_{t-2}^{-}	0.094	ΔHE_{t-2}^{-}	0.212	ΔHG_{t-2}^{-}	0.002
	(0.499)		(0.367)		(0.293)		(0.031)		(0.978)
ECT^{+}	-0.072	ECT^{+}	-0.053	ECT^{+}	-0.385	ECT^{+}	-0.532	ECT^{+}	0.001
	(0.184)		(0.291)		(0.005)		(0.000)		(0.976)
ECT-	-0.073	ECT-	-0.045	ECT-	-0.037	ECT-	-0.116	ECT-	-0.156
	(0.171)		(0.457)		(0.673)		(0.229)		(0.012)

Note: P is the producer price, G is the wholesale price, E is the retail price and ECT is the error correction term. * Significant at 10 percent real level, ** Significant at 5 percent real level

Transmission from wholesale prices to producers is significant in the short term only when there is an increase in wholesale prices at t-1, whereas a decrease in wholesale prices does not affect producer prices. In the long run, only ECT- coefficient which would be significant, indicates that in the long run producer prices will adjust to rise within a period of four days when the price formed is below the equilibrium price or when there is an increase in wholesale prices.

Karantininis, Katrakilidis, and Persson (2011) explain that asymmetrical price transmission can occur in the short and long term. In the short term, price transmission is caused by an *adjustment cost* factor where without *market power* the price will adjust back to the balance line in the long run. Or, it can be shown from the significant ECT value that indicates the absence of *market power.* In the red chili commodity, ECT value is significant only in wholesale-retail model, while the other models do not. It means, in addition to the formation of prices at retail, there is *market power* that also determines prices.

On the shallot commodity, the producer-retail and retail-producer models showed significant ECT results while the other models did not. This shows that in the long run there is asymmetric transmission in the wholesale-retail, retail-wholesale and wholesale-producer relations. In other words, there is *market power* in price formation at these marketing institutions.

Abuse of *market power* by intermediary traders in the red chili and shallots market chain in Indonesia is generally related to the market structure. Prastowo, Yanuarti and Depari (2008) explain that the market structure greatly influences the size of the profit margins determined by economic agents in the marketing chain. Market structure is determined by several criteria, namely (1) the number of companies operating in the market, (2) whether there are obstacles for companies to enter and exit the market, and (3) the characteristics of the products traded. The market structure will further influence the strength of the traders therein to influence market prices.

In a monopolistic market structure, the trader acts as a price setter, consequently the trader has the discretion in setting prices and obtaining optimal profit margins. Conversely, in a perfectly competitive market (or at least highly competition), the trader would only act as a price taker, where the trader does not have the power to influence prices in the market, so the profit margin he gets is very small. If seen from the price asymmetry that indicates the existence of market power at the trader level, it can be

concluded that there is a regulation of price by one or several traders that brings negative effect to consumers or farmers.

Kharin (2015) showed the same result that prices were not transmitted between marketing institutions and traders generally had market power. From the results of transmission of prices between marketing institutions, there is an inefficiency in marketing red chili and shallots in Indonesia.

Commodities of red chili and shallots that do not have a standard price such as HPP in rice cause traders to have the power to raise and lower prices following market developments. So far there are only reference prices for these two commodities. According to the regulation of the minister of trade number 27 year 2017, the reference price for red chilli commodities per kg at retail level is IDR 28 500, while for shallot commodities is IDR 32 000 / kg. If the price is above the reference price, the government allows imports of both commodities. So, the pricing rules for the two commodities are not as complete as the HPP for rice.

Serra and Goodwin (2002) state that in agricultural products with short shelf life, the asymmetric price transmission pattern that occurs leads to the negative type. Intermediary traders who sell *perishable* goods are less likely to raise their output prices despite rising input prices. The reason is that traders are worried that their goods will not sell. So that traders prefer to reduce their margins, by not raising the output price, rather than having to bear a greater loss, due to goods that are not selling.

The research result Elvina (2016) found that market structure of red chili market lead on oligopsony at the wholesaler level, making it easier among the traders in coordinating and collectively have market power in determining the price at the farm gate and the consumer. Meanwhile, at the level of farmers and retailers who faces a competitive market in selling red chilli cause they do not have market power to affect the price. This causes both farmers and retailers to not be able to implement price setting strategies to maximize their profit.

The market structure of shallots is also similar to red chili, in the marketing the shallot market margins tend to be more clustered in large traders and suppliers so that when prices fall prices are transmitted well to the farm level. This means that farmers continue to receive low and fluctuating prices, even though wholesalers do not respond to price increases.

The fundamental difference between price transmission caused by market power and cost adjustment is only the time period. Adjustment costs that occur in the short term are only delaying the transmission or price adjustment process, and in the long run there will be a perfect price adjustment (Karantininis 2011; McCorriston, et al 2000). While asymmetry caused by market power can last for a long time, because it not only affects the time of adjustment but also affects the magnitude of adjustment (Meyer and von-Cramon Taubadel 2004).

These results indicate that farmers and consumers are in a weak bargaining position, and conversely intermediary traders are in a dominant position in the shallot trade in Indonesia. Specifically regarding the analysis used, the two models used namely the Houck and ECM-EG models showed similar results. This means that both models have been able to explain the asymmetric phenomenon of price transmission that occurs in the relationship between institutions of shallot marketing properly.

Results of Wald test between wholesale and producers prices and indicate the value of positive shock and negative shock of independent variables is not significant, which means

that in the short term there is no asymmetrical transmission of prices between the wholesale market and the producer market. The results of the ECT $^{+}$ and ECT coefficient tests $^{-}$ also show there is no asymmetric transmission in the wholesale price of red chillies with the manufacturer. Although asymmetrically the results of the estimation model show a difference in response between the positive and negative wholesale price *shock* coefficient and the positive and negative ECT coefficients, but statistically it does not show a significant sign. So that it can be said that the transmission between wholesale prices with short-term and long-term producer prices is statistically symmetrical.

The conclusion based on Wald's test is different from Firdaus and Gunawan's (2012) and Jubaedah (2013) research which concluded that between PIKJ wholesale market and the production center markets, especially in West Java, did not occur market integration. This difference in findings may be due to the period of the data and the source of the data used. The study uses monthly data for the data period before 2012. The source of producer price data comes from the Central Statistics Agency. While this study uses weekly data from January 2012 to September 2014 with sources of producer price data coming from the Department of Agriculture and Food Crops of West Java Province.

The second asymmetric test result is the price of the wholesale market red chili and the price in the consumer market. Based on Table 5, in the short-term price transmission the wholesale price changes in the positive and negative period t indicate a significant value. Increases and decreases in wholesale prices in the same period are transmitted to producers differently. The negative shock of wholesale prices in the previous period showed a significant value but the positive *shock* did not show a significant sign. This means that if the wholesale price of the previous period had decreased, the price of consumer chillies today also fell.

If the wholesale price of the previous period has increased, current consumer prices will not be affected. The negative shock of consumer prices in the previous period showed a significant negative value, while the positive shock was not significant. This means, if the previous period's consumer prices go down, the prices of the current period will again move up. However, if the previous period's consumer prices rise, then this does not affect the current period's consumer prices.

In the wholesale price transmission model with long-term consumer prices indicate that the value of ECT + is significant and negative. The ECT $^{+}$ coefficient value of -0.406 means that when price deviations are above the balance line, that is, when prices in consumers do not go down when wholesale prices decline, then after about four months more consumer prices will adjust to wholesale prices. So the time needed to return to the balance line is approximately 4 to 5 months. On the contrary, the value of ECT $^{-}$ shows a sign that is not significant. If there is a deviation (the increase in wholesale prices is not followed by an increase in consumer prices), then the deviation will not return to the initial balance. In other words, consumer prices do not adjust to wholesale price increases.

These results are in line with the research of Acquah and Dadzie (2010) in analyzing the transmission of corn prices at the wholesale and retailer level in Gana based on the *asymmetric* ECM Von Cramon-Taubadel and Loy tests. The increase in wholesale prices will be responded to more quickly by consumer prices than the decline. The conclusion that can be drawn from the transmission of red chilli and shallots in each marketing chain is that the wholesale price in its formation tends not to be influenced by other marketing chains, but it influences the formation of

prices at other levels. Whereas producer and retail prices in their formation tend to be influenced by price signals from other marketing chains. To see more about the symmetry of the price formed, then continued analysis is used, namely the Wald test.

TABLE 4. RESULTS OF WALD TEST ESTIMATION ON THE SYMMETRY OF THE SHALLOT PRICES

	G→E	E→G	P→E	E→P	G→P
$\Delta P^{+}_{t-1}= \Delta P^{-}_{t-1}$			0.0752*	0.0000**	0.0000**
$\Delta P^{+}_{t-2}= \Delta P^{-}_{t-2}$			0.8572	0.0000**	0.0001**
$\Delta P^{+}_{t}= \Delta P^{-}_{t}$			0.8443		
$\Delta G^{+}_{t-1}= \Delta G^{-}_{t-1}$	0.7226	0.9406			0.3239
$\Delta G^{+}_{t-2}= \Delta G^{-}_{t-2}$	0.4259	0.3727			0.1576
$\Delta G^{+}_{t}= \Delta G^{-}_{t}$	0.2582				0.5479
$\Delta E^{+}_{t-1}= \Delta E^{-}_{t-1}$	0.9468	0.1649	0.5214	0.3901	
$\Delta E^{+}_{t-2}= \Delta E^{-}_{t-2}$	0.0024**	0.1603	0.0014**	0.0383**	
$\Delta E^{+}_{t}= \Delta E^{-}_{t}$		0.6279		0.0522*	
$ECT^{+}= ECT^{-}$	0.9975	0.9329	0.0335**	0.0026**	0.1268

Note: P is the producer price, G is the wholesale price, E is the retail price and ECT is the *error correction term.* * Significant at 10 percent real level, ** Significant at 5 percent real level

The results of the wald test wald test are used to ensure an indication of the existence of asymmetry in the price transmission process between institutions involved in the marketing chain of red chili and shallots. Wald test conducted on each variable, both when there are positive or negative shocks in the short or long term. If in a transmission relationship between marketing institutions there are variables that respond differently to positive and negative shocks, which are indicated by the rejection of the null hypothesis (significant), then it can be said to have occurred asymmetry in the process of price transmission in the market. Conversely, if there are no variables that respond differently to shocks, which are indicated by the absence of significant variables, then it can be said that the transmission of prices in the two markets is symmetrical.

Table 4 shows the results of the Wald test on the shallot commodity. In the short term, all marketing chains show significant Wald test results, which means there is a price asymmetry between marketing institutions in each chain. Only significant wholesale and retail relationships indicate price asymmetry in the long run. Whereas the relationship between other markets in the long run shows a symmetrical relationship. Regarding this, the European Commission (2009) in his research stated that specifically for agricultural products, product characteristics, such as shelf life and seasonality, are important factors that influence the level of market integration and the transmission of the asymmetrical prices for agricultural products.

The Wald test on the shallot commodity is shown in table 4, showing that almost all marketing chains have price asymmetries, except in the retail to wholesale chains. Whereas the relation of producers to retail and retail to producers shows the results of price asymmetry in both the short and long term. The asymmetry price transmission indicates that there is an uncompetitive market competition. Whereas symmetric price transmission means that the market has competitive competition.

IV.CONCLUSION

Movement of shallot price was fluctuative with different patterns of movement between prices at the producer, wholesale, and consumer levels throughout 2017. Based on the coefficient of variation (CV), prices at the producer level tend to be more volatile when compared to prices at the wholesale market level and consumer level. Throughout 2017, the transmission of shallot prices went unevenly where there is a short-term as well as long-term asymmetric relationship in several channels. This means that in the short term price increases that occur in the wholesale market are not perfectly transmitted to producers. The opposite happens when price increases that occur at the producer level, the price are not perfectly transmitted to the wholesale market. In the long run, price asymmetry causes prices not to return to equilibrium. This demonstrates that inefficiency of marketing institutions has occurred.

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