PRICE TRANSMISSION ANALYSIS OF ONIONS, GARLIC, AND LARGE RED CHILI IN INDONESIA

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ABSTRACT

The objectives of determine the price-forming market between the producer and consumer markets of shallots, garlic, and large red chilies in Indonesia. Analyze the transmission of commodity prices of shallots, garlic, and large red chili at the level of producers to consumers. Analyze the length of time for adjusting the price of shallots, garlic, and red chilies at the level produce and consumers in Indonesia. Indonesia was chosen as the object because Indonesia have fluctuating prices. Transmission analysis was performed using ECM. In the ECM, short-term imbalances for short-term unbalanced adjustments and long-term equilibrium adjustments. The results of this show that price changes in shallot commodities occur at the producer level while in garlic and red chili commodities, price changes occur at the consumer level. In the process of transmitting shallot prices in Indonesia, the adjustment of chili prices at the consumer level experienced a lag of 5.7%, garlic commodities adjustments in garlic prices at the produce level experienced a lag of 7.7% and in commodity onion prices the adjustment of chili prices at the producer level experienced a lag of 7% towards a long-term price balance. The long-term relationship shows that if the time of the increase in price consumers rises, the price of chili at the producer level will also rise. The value of the ECT coefficient explains that the adjustment between the long-term correctable is 3.3%, 4.5%, and 2%. This means that price adjustments to the price balance conditions on the commodity of shallots, garlic, and large red chili in Indonesia take a period of 2 months.

Keywords: *EMC; Transmission Price; Onion; Garlic; Large Red Chili;*

INTRODUCTION

Vegetable and fruit crops are crops that maintain food balance, so they need to be available in sufficient quantities, high quality, and affordable prices (General Administration of Horticulture, 2011). Commodity onion, garlic, and large red chili is a commodity which has a good market share level, because these three commodities are used by the public to be used as seasonings. Commodity often experiences price changes caused by types of goods that are easily damaged or damaged quickly (Ariningsih, 2004).
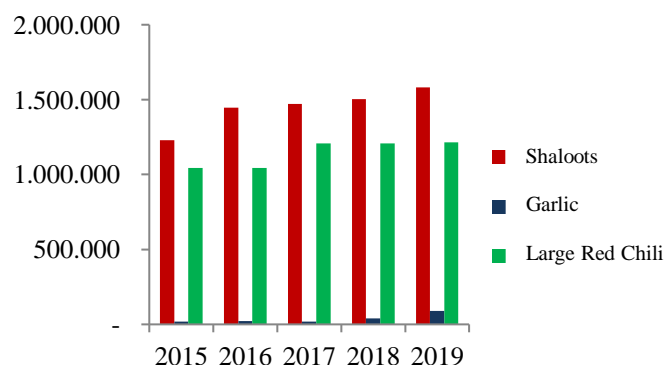

Figure 1. Production of Shallots, Garlic, and Large Red Chili in Indonesia in 2015-2019 (Ton)
Source: Ministry of Agriculture 2019 (Processed)

Based on data from the Ministry of Agriculture (2019), from chart Figure 1 the production of shallot, garlic, and large red chili commodities from 2015-2019 continues to

increase. Because this commodity is consumed by all circles of society without paying attention to social levels, the production of shallots, garlic, and chilies needs to be maintained and increased every year because if at harvest time and this commodity does not meet demand, it will have an impact on prices.

Price transmission is an analysis that describes the extent of the impact of changing the price of an item at one market level on price changes at another price changes to the next market level involve time. The time referred to is the length of time needed for the price of a market level to reach the next market level to change or be transmitted. The magnitude of price changes in both the short and long term can be well indicated. One of the purposes of this price transmission is to find out how quickly the process of adjusting price changes that occur at the consumer level is passed on to farmers (Sukmawati 2015). The difference in price or the difference in price differs between the price issued by the consumer and the price received by the producer farmer, this indicates the price that is quoted by consumers not the real price of farmers. Seen in the chart pattern, the price that occurs at the level of consumers and producers, almost has the same trend or movement of the chart. The chart shows an increase in the months followed also in the year after which is almost the same, as well as when there is a price decline. The pattern of formation at the level of consumers and producers according to Widayatsari (2013) is to follow the market, which is related to the availability of chili supply and the relationship between demand and offerings with manufacturers and consumers. The size of the price passed on in the marketing system, which occurs at the producer and consumer level shows proses price transmission in the distribution margin with the length of time of the adjustment (Rahmi and Arif, 2012).

Many methods can be used to measure price transmission, one of which is the *ECM*. In ECM, there are several stages used, namely the t-shirt test, cointegration and ECM. From several stages of testing, the causality test is used to see the price-forming market between the producer and consumer markets. After that, stages can be carried out to see the length of time for price adjustments from the producer and consumer markets using ECM. This method is also widely used in research on price transmission in the research of Fakir Azmal (2015), Miftahul Jannah, Sukiyono, Asriani (2020), Januar Arifin Ruslan et al (2013).

RESEARCH METHODS

Data Source Type

The data used in this study is time series data for 120 months or with vulnerable data for the last 10 years, data from the period 2010:1 to 2019:12. The data is secondary data in the form of monthly prices of onion, garlic, and chili commodities at the level of Indonesian producers and consumers obtained from the Central Statistics Agency (BPS).

Data Analysis

Transmission analysis was performed using an ECM. In the ECM, short-term imbalances for short-term equilibrium adjustments and long-term equilibrium adjustments (Kusumah 2018; Muhammad 2014).

Data that are already stationers at the same level, can be seen in short-term relationships can be seen through the Granger Causality Test, Reziti dan Panagopolus (2008) said that the Granger Causality Test is used to find out which markets play a role as the reference market and which markets are followers in the price transmission process. The cointegration test is carried out, however, if the data is not stationary at the same degree, the differentiation stage is carried out and the ECM test can also be carried out even though the nonstationary is at the same degree.

Unit Root Test

Unit root test is a method for assessing the stationariness of time series data. Time series data sometimes have stationary random processes rather than stationary. The random transient process causes the data trend to be non-stationary, so its inversion will cause regression errors. back).

Causality Test

The causality test is used to examine the direction of the bond between chili price factors in marketing institutions. Whether at the time of marketing curly red chili the price is set on the upstream side or set based on changes from the downstream side.

Cointegration Test

This method is used to see the distribution of data and see stationary residual/error data. This test is performed when the movement of data is not static but moves together over a long period of time. If the variables are recorded as equally stable at similar wavelengths, then they can be said to be cointegration or have a long-term relationship (Juanda and Junaidi 2012).

Error Correction Model (ECM) Methods

The method used to find out how the relationship between the estimated variables uses the Error Correction Model (ECM) test and uses the EViews 7 software. The ECM (Error Correction Model) test is used to look at the short-term and long-term influence of each of the free variables and bound variables. The ECM test is to scrape short-term imbalances towards long-term equilibrium, and can explain the relationship between bound variables and free variables in the present time with past times.

The equations of the Error Correction Model's (ECM) model, (Bakari, et al 2013) are:

$$\Delta HPt = \beta 0 + \beta 1 \Delta HKt - 1 + \Delta ECTt - 1 + e_t$$

Information:

ΔHPt	= Change in chili prices at the producer level over a period to t
ΔHKt−1	= Change in chili prices at the consumer level over time period to t
ECTt-1	= Error Correction Term
β0.β 1	= Estimated parameters

RESULTS AND DISCUSSION

Price Transmission of Shallots, Garlic, and Large Red Chili
Causality Test

The causality test is used to determine the causal relationship between onion prices at the producer and consumer levels. A causality test is performed to look at the reciprocal relationship between 2 or more variables, and identify the dominant market in the formation of market prices (Katrakilidis, 2008). Reziti and Panagopolus (2008) say that the Granger Causality Test is used to find out which markets play a role in the reference market and which markets are followers in the price transmission process. Based on the results of the Granger Models causality test, it was obtained that prices at the producer level have the power to affect onion prices at the producer level The price of onions at the producer level affects the price of chili at the consumer level. But the price of shallots at the consumer level does not significantly affect prices at the producer level.

The result of the Causality Test p there is the price of shallots, onion spit and red chilies at the level of producers and consumers on the commodity shallot the price-forming market is the producer market. This is known because the probability value for onion prices at the producer level is 0.527, and the producer market is the shaper of onion prices at the consumer

level. However, unlike the onion commodity, the garlic commodity, and the big red chili from the probability results for both market relations, the consumer market is more dominant among the produce. The probability value for garlic prices at the consumer level is 0.061 and the probability value for red chili commodities at the consumer level is 0.4001, which means that from garlic commodities and red chilies, the consumer market becomes a price generator. The results of this study are in line with research conducted by Elvina et al (2017), which states that prices at the consumer level affect prices at the producer level. Statistical values for causality tests of the three commodities can be seen in Table 1.

Table 1. Causality test results

Hypothesis			F-Statistics	Prob.	Conclusion
		Shallot			
HK	----->	HP	0.644	0.527	Price formation occurs in the manufacturer's market
HP	——>	HK	0.240	0.786	
		Garlic			
HK	——>	HP	2.489	0.087	Price formation occurs in the consumer market
HP	----->	HK	2.862	0.061	
		Large Red Chili			
HK	——>	HP	0.521	0.952	Price formation occurs in the consumer market
HP	----->	HK	0.932	0.400	

Information:
HP = Manufacturer Price,
HK = Consumer Price

Based on table 1 when viewed from the statistical F value and probability for the onion market the price at the producer level affects the price at the consumer level while for the garlic market and red chili large the price at the consumer level affects the price at the producer level. The results of the causality test show that the price of shallots at the producer level has a significant effect on affecting the price of shallots at the consumer level while the price of shallots at the consumer level does not affect prices at the producer level. This is obtained from the result that the market probability value of producers is less than the price at the consumer level. The rehabilitation value in the consumer market is 0.527 while in the consumer market the probability value is 0.786. The Granger Causality Test between onion prices at the producer and consumer levels occurred at lag 2. The relationship between onion prices at the producer level has a significant effect, meaning that it has an influence on the formation of the finished price. These results imply that prices at the producer level affect prices at the level of other market institutions.

The price of garlic at the consumer level has a significant effect on influencing the price of garlic at the producer level and the price of garlic at the producer level does not affect the price at the consumer level, this conclusion is obtained from the results of the causality test. This suggests that retailers (consumer prices) set the selling price of garlic based on the selling price of the parent market. This is because from the causality test, the probability value of the consumer market is smaller than that of the producer market, where the consumer probability value is 0.061 while in the consumer market it is 0.087. When viewed from the F-statistical value, the price of garlic at the consumer level has a great influence on the price of garlic at the producer level. These conditions illustrate that the garlic market in Indonesia. The higher the demand for garlic in the consumer market, the more it will affect the price of garlic at the producer level.

The Granger Causality Test between large red chili at the producer and consumer level occurred at lag 2. Changes in the price of red chili at the producer level have no effect on prices at the consumer level, meaning that they have no effect on the price formation that occurs. As for the price at the consumer level, it has a one-way relationship with the price at the producer level of red chili with a probability value of red chili 0.400 in the producer market while in the consumer market it is 0.952. This result implies that prices at the consumer level affect prices in other market institutions, meaning that 1 price change at the producer level is caused by price changes that occur at the consumer level. The results of this study are in line with Kustriani et al (2018) which states the relationship between prices at the consumer and producer levels. This means that when the price of garlic and red chili increases or decreases, prices at the producer level will be affected by these activities. This is also reinforced by the statement of Kasriyno et al (2007) that price changes are more driven due to demand.

The rate of price change at the producer level is smaller than the rate of price change at the consumer level. This condition can occur due to lack of price information at the producer level so that it is more profitable for the constituency because the decision to increase the price is determined by the consumer, while the producer is only the recipient of a weak price in price formation (Soukotta, 2015).

After knowing the direction of the market relationship, chili prices at the consumer level become market leaders, to be able to see the correction factors of the relationship between the two marketing institutions, a cointegration test was carried out which functioned to show the trend of data movement not static, but went hand in hand. This is also true in the long run.

Cointegration Test

The cointegration test was carried out to see the occurrence of long-term relationships between producer and consumer market institutions (Muhammad 2014). If in the long term the prices of onions, garlic, and large red chili at the two market institutions show a linear constant relationship, then it can be said that the price of shallots has a long-term relationship. The variables in the model can be said to be cointegrated or have a long-term relationship if the variables are stationary at the same degree moving with the same wavelength (Juanda and Junaidi, 2012). Table 2 is the results of cointegration tests for producer and consumer-level onion market institutions.

Table 2. Cointegration Test Results (Long Term)

Variable	Coefficient	Standard Error	t-Statistics	Prob.
Shallot				
HK	0.057	0.005	10.46	0.000
Constant	23529.28	14596.29	1.612	0.109
R-Square	0.48167			
F-Statistics	109.4434			
Garlic				
HK	0.077	0.003	22.87	0.000
Constant	-8885.40	9065.06	-0.980	0.329
R-Square	0.816051			
F-Statistics	523.4814			
Large Red Chilli				
HK	0.007	0.005	1.426	0.000
Constant	187656.5	2265.67	8.428	0.156
R-Square	0.016943			
F-Statistics	2.0033743			

Source: Estimation results using EViews 7

Based on the results of the cointegration test in Table 2, the price of onion, garlic, and

large big chili red disregard at the consumer level has a long-term relationship to the price of chili at the producer level. This is seen in the probability value of a significant variable at a probability level of 5%. These results imply that several co-integrated equations, have a long-term relationship between prices at the producer and consumer levels.

The two market levels have a long-term relationship, namely the price of shallots at the consumer level, having a long-term of 0.057 (5.7%). This means that when onion prices at the consumer level increase or decrease, the long-term relationship for onion prices at the producer level will increase/decrease by 5.7%. The value of the coefficient on garlic is 0.077 (7.7%) where when the price of garlic at the consumer level increases or decreases, the long-term relationship for chili prices at the producer level will increase/decrease by 7.7%. Chili prices at the consumer level have a long-term relationship to chili prices at the producer level of 0.007 (7%). Where when the price of red chili at the consumer level increases or decreases, the long-term relationship for chili prices at the producer level will increase/decrease by 7%. Because the two levels of the market have a long-term relationship, to find out how much the time adjustment rate of the variable is to the long-term and short-term equilibrium. The test used is ECM

Model Estimation

Error Correction Mechanism (ECM) is a time series data analysis used for variables that have dependencies that are often called cointegration. The ECM method is used to balance the short-term economic n relationships of variables that already have a long-term economic balance or relationship (Marwadi, 2018; Ajija, 2011). According to Basuki (2017), the ECM method is a descriptive analysis method that aims to identify long-term and short-term relationships that occur, due to the cointegration between estimated variables. Before proceeding to the ECM model, first in the process of ECM analysis, the correction factor is known. This correction factor is derived from the regression on the long-term relationship for the three variables. This correction factor is used to correct the short-term relationship time on prices at the producer and consumer levels.

Table 3. Short-Term Estimation Results by ECM Method.

Variable	Coefficient	Standard Error	t-Statistics	Prob.
Shallot				
HK	0.0316	0.0042	7.4263	0.000*
ECT	0.0033	0.0018	1.8223	0.0710
Constant	692.388	805.613	0.8594	0.1504
R-Square	0.342167			
F-Statistics	0.319864			
Garlic				
HK	0.0324	0.0034	9.5133	0.000*
ECT	0.0043	0.0018	2.3142	0.0224
Constant	943.41	651.666	1.4477	0.1504
R-Square	0.440772			
F-Statistics	45.71430			
Large Red Chilli				
HK	0.012	0.0054	2.3913	0.0184
ECT	0.002	0.0017	1.3442	0.1815
Constant	713.39	1626.215	0.4386	0.6617
R-Square	0.05225			
F-Statistics	2.033743			

Source: Price data of shallots, garlic and chili processed

The ECM model is used to see how the correction factors of the price transmission of onions, garlic, and large red chili. The prices of onions, garlic and large red chili at the

consumer level have a short-term relationship with coefficient values of 0.031, 0.032 and 0.012. For the correction factor of the ECM model on the price of shallots, garlic, and large red chili at the consumer level n to the price at the producer level is 0.0033 for shallot commodities, 0.004352 and for red chili commodities by 0.053820. The ECT coefficient value of shallots is 0.0033, garlic is 0.0043 and onion commodities are0.002. This suggests that the formation of prices at the producer level is positively affected. This means that the level of adjustment of onion commodity price formation at the consumer level to the price of chili at the producer level is only 3.3%. For garlic commodities at 4.5% and for chili commodities at 2% the process of adjusting changes in chili prices at the producer level towards a long-term balance. The value of the ECT coefficient explains that the adjustment between the long-term correctable is 3.3%, 4.5% and 2%. This means that price adjustments to the price balance conditions of onion, garlic and large red chili commodities in Indonesia take a period of 2 months.

According to Widarjono (2007) the ECT imbalance correction coefficient in the form of absolute values explains how quickly the adjustment process is needed to obtain a long-term equilibrium value. This is the same as the research conducted by Arifin (2016) states that the price decrease at the producer level at the previous time will not have any effect on prices at the consumer level. Price conditions in the producer market that have a slow adjustment in price changes, indicate that the price information at the producer level is still quite long.

To see the long-term relationship in the ECM model on price formation factors at the producer level of the onion, garlic, and red pepper market institutions at the consumer level, it can be seen in Table 4.

Tabel 4. Long-Term Influence

Variable	Coefficient	Standard Error	t-Statistics	Prob.
Shallot				
HK	0.057	0.005	10.46	0.000
Constant	23529.28	14596.29	1.612	0.109
R-Square	0.48167			
F-Statistics	109.4434			
Garlic				
HK	0.077	0.003	22.87	0.000
Constant	-8885.40	9065.06	-0.980	0.329
R-Square	0.816051			
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Large Red Chili				
HK	0.007	0.005	1.426	0.000
Constant	187656.5	2265.67	8.428	0.156
R-Square	0.016943			
F-Statistics	2.0033743			

Source: Price data of onion, garlic, and chili onion, processed

In the process of transmitting shallot prices, price adjustments at the consumer level in shallot commodities experienced a lag of 5.7% towards a long-term price balance. This long-term relationship suggests that if at the time of price increases at the producer level rise, the price of shallots at the consumer level will also rise.

The price adjustment in garlic and red chili commodities is 7.7% and in large red chili commodities is 7% towards the long-term price balance. This is the same as a study conducted by Mifthahuljanah (2020) stating that the adjustment of chili price increases to farmers is not fast and the same. However, for both levels the price of chilies has a long-term relationship. This long-term relationship shows that if at the time of rising prices at the consumer level rises, the price of chili at the producer level will also rise. But the adjustment time process is a little longer at the producer level to raise the price or not fully passed on to the manufacturer.

CONCLUSIONS AND SUGGESTIONS

Based on the results of data analysis regarding the transmission of shallot, garlic, and large red chili commodity prices in Indonesia, Price changes in shallot commodities occur at the producer level while in garlic and red chili commodities, price changes occur at the consumer level. In the process of transmitting shallot prices in the country, the adjustment of chili prices at the consumer level experienced inaction by 5.7%, garlic commodity adjustments in garlic prices at the producer level experienced inaction of 7.7% and in commodity onion prices adjustments to chili prices at the producer level experienced a lag of 7% towards a long-term price balance. The long-term relationship shows that if at the time of rising prices in consumers rises, the price of chili at the producer level will also rise. The value of the ECT coefficient explains that the adjustment between the long-term correctable is 3.3%, 4.5%, and 2%. This means that price adjustments to the price balance conditions of onion, garlic and large red chili commodities in Indonesia take a period of 2 months.

The suggestion it is necessary to gradually plant onions, garlic, and large red chili, so that farmers can make continuous bidding, thus price stability at the farmer level and the consumer market will be more controlled. One of the causes of price transmission is the misuse of market power. In response to this, government policy is needed even though this is also able to cause the condition of the transmission pattern to be imperfect, but the policy must be carried out to the level of farmers because farmers are the first producers in producing shallots, garlic, and large red chili in Indonesia.

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