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THE ANALYSIS OF MAIZE MARKET INTEGRATION IN EAST JAVA

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ABSTRACT

An Uncontrollable Maize price fluctuation can harm farmers when the price changes in the level of consumer price and it is not followed at the level of the producers. This study used monthly prices data during 2009-2016 in East Java province. Methods of analysis used, are in the form of price variations and market integration analysis. The results of the prices variation analysis are maize prices that gained at the level of the producers, wholesalers, and consumers are low fluctuating, but the results of the market integration show that between the producer price and consumer price, between the producer price and the wholesale price, and between wholesale prices and consumer prices are integrated in the short term and are not integrated in the long term, this indicates that the price of maize markets information systems had not been running perfectly. So, the Government needs to fix the system to make the price information of maize can be well-integrated.

KEY WORDS

Price, maize, price integration, market.

The government tries to increase the income of maize farmers through the production. Increased of maize production since 2000 amounted to 9,677,000 tons, imported 1,264,575 tons and exports of 28,066 tons, in 2008 with production of 16,317,252 tons, imports decreased by 264,665 tons and exports increased by 107,001 tons, and production continued to increase to 19,377,030 tons, imports also increased to 3,175,362 tons and exports fell to 37,889 tons in 2014 (Central Bureau of Statistics, 2015). This shows that the export and import of maize in Indonesia which is Import activity even greater than export of maize, or in other words Indonesia is still experiencing a deficit of maize production. In an effort to increase maize production in addition to meeting the demand, aims to increase the income of maize farmers as well. The income of maize farmers is increasingly constrained by increasing production costs, and farmers continue to improve the yield of maize sells to cover production costs. The income of maize farmers is not only influenced by costs and prices, according to Magesa, et al (2014), but also an access to the market becomes necessary for the farmers as it is a strong and direct impact for farmers' income.

Maize's marketing with a long marketing channel urges the increasing of maize's price. This makes the gap between producers and consumers, because when prices are low, farmers or producers will get the disadvantaged, and if prices rise then consumers will. The longer the marketing channel exists, the higher the marketing margin. The marketing margin is the difference between the price paid by the consumer and the price that obtained by the producer, or as the price of marketing services of the demand and the provision of such services (Tomek and Kenneth, 1990). Therefore, If the seller and buyer already have accurate and continuous market information, then the price changes will be responded immediately by the market participants, and decision-making will be done quickly and appropriately. In an integrated market, the price of different markets has a positive relationship as a reflection of the smooth flow of market information (Ravalion, 1986). According to Stephens, et al. (2008) the flow of information in the market and trading networks can cause transmission prices amongst market without trade flow. The market is

also integrated by the producer's decision although there is no direct trade that occurred between the market (Srofenyoh, 2015). According to Ye and Jinggui (2015), if the price changes in the level of consumer price changes followed at the level of the producers then showed a market integration between the two. The difference in price can be equal to or less than the cost of transportation, as a strong manifestation of the Low One Price, but price movements should not be integrated (Anindita and Nur, 2017). When the market is integrated, then the flow of goods (food) between the region and the lower prices fluctuates, so the knowledge of market integration is necessary because market integration will inform the analysis of the goods security(food), an appropriate response to the crisis, the possibility of negative impact of food aid and the possibility of local procurement (Wold Food Program, 2007). Having known about the price fluctuations and marketing integration between manufacturers, wholesale markets, and the consumer, is expected to transmit market information from the manufacturer to the consumer as well as vice versa. So marketing agencies can help to create a marketing system that is efficient and effective in order to prosper, consumers, manufacturers and marketers. This research aims to analyze the Maize Market Integration in East Java province.

MATERIALS AND METHODS

The data used is the price of maize at the level of producer, maize price at the level of wholesaler and maize price at the level of consumer from January 2009 until December 2016 in Tuban District, Kediri District, Malang District, Jember District, and Lamongan District to represent the maize center area in East Java. The following methods are used to analyze of maize price variation and analysis of market integration.

Analysis of Maize Price Variation. The price of maize at the level of the producers, wholesalers, and the consumer movement was analyzed from year after year, from the development of the price of each price series. The equation used to analyze maize price fluctuations which can be formulated as follows:

$$\text{Coefficient of variation (CV)} = \frac{\text{Standard deviation}}{\text{average}} \times 100\% \quad (1)$$

The coefficient of variation obtained from time series the data of pricelist that is describing the price fluctuations (average against junction) that are used to find out the stability of prices on a commodity. The smaller the value of coefficient of variation, then it can be interpreted that the price relatively more stable or low fluctuations (Abdi, 2010).

Analysis of Market Integration. Market integration is a measure that demonstrates how far the price changes that occur in the reference market will lead to price changes also in the market followers (Asmarantaka, 2009). The concept of market integration is different from Low One Price (LOP). Perfect market integration does not mean having a strong form of LOP. Because a strong LOP does not have to be followed by perfect market integration. This is because the price difference can be equal to or less than the transportation cost as a strong embodiment of LOP but price movement should not be integrated (Anindita and Nur, 2017).

RESULTS AND DISCUSSION

Results of price variation Analysis. According to ministry of trade (2010), criteria of price fluctuations, that is, if the value of the coefficient of variation of the price ranges between 4 – 8% the price is said to be stable, but if the value of the coefficient of variation of more than 8% of its indicated price fluctuations is high or unstable. Analysis of Price variation of maize at the level of the manufacturers, wholesalers and consumers is as follows.

Result of producer price variation Analysis. Maize's price developments at the level of the producers during 2009 – 2016 demonstrating that the value of the coefficient of variation of prices ranged from 2.28% to 7.65% with an average value of the coefficient of variation of

4.89%. This indicates that the value of the coefficient of variation the price of maize is on the criteria of ministry of trade between 4 – 8% which means that the price of maize at the producer level low fluctuating or tend to be stable. The development of the maize price variations in the level of the producers during 2009 – 2016 can be seen in table 1.

Figure 1 – Framework of VAR Model formation (Rosa, *et al*, 2014, assessed)

Table 1 – The Development of Maize Price Variation at Producer Level during 2009-2016

Year	Average price	Standard Derivation	coefficient Variation %
2009	2591,67	125,18	4,83
2010	2971,67	153,38	5,16
2011	2865,83	186,81	6,52
2012	2633,33	105,94	4,02
2013	2926,67	66,79	2,28
2014	3050,83	71,8	2,35
2015	3288,33	207,88	6,32
2016	3711,67	283,9	7,65
Mean	3005	150,21	4,89

Source: department of Agriculture and Food Security of east java province, 2016.

Result of wholesaler price variation analysis. Development of maize's prices in the wholesaler level during 2009 – 2016 demonstrating that the value of the coefficient of variation of prices ranged from 1.6% to 6.8% with an average value of the coefficient of variation of 4.02%. This indicates that the value of the coefficient of maize's price variation is on the criteria of ministry of trade between 4 – 8% which means that the price of maize at the wholesaler prices is low fluctuating or volatile. The development of the maize's price variations in the wholesale level during 2009 – 2016 can be seen in table 2.

Table 2 – Development of Maize Price Variation at wholesale Level during 2009-2016

year	Average price	Standard Deviation	Coefficient Variation%
2009	2918,33	130,02	4,46
2010	3270	164,15	5,02
2011	3348,33	176,73	5,28
2012	3070	62,96	2,05
2013	3316,67	66,51	2,01
2014	3518,33	56,22	1,60
2015	3748,33	185,37	4,95
2016	4133,33	280,95	6,80
Mean	3415,42	140,36	4,02

Source: Department of Agriculture and Food Security of East Java province, 2016.

Result of consumer price variation analysis. The development of the price of maize at the consumer level during 2009 – 2016 demonstrating that the value of the coefficient variation of prices ranged from 2.11% to 7.73% with an average value of the coefficient of variation of 4.5%. This indicates that the value of the coefficient variation the price of maize is on the criteria of ministry of trade between 4 – 8% which means that the prices of maize at the consumer levels is low fluctuating or tend to be volatile. The development of the maize price variations in the level of consumer during 2009 – 2016 can be seen in table 3.

Table 3 – Development of maize Price Variation at consumer Level during 2009-2016

year	Average price	Standard Deviation	coefficient Variation %
2009	6375,00	165,83	2,60
2010	4243,33	231,65	5,46
2011	4109,17	260,54	6,34
2012	3773,33	83,70	2,22
2013	4058,33	156,43	3,85
2014	4413,33	93,16	2,11
2015	4640,83	264,25	5,69
2016	5301,67	409,74	7,73
mean	4614,37	208,16	4,50

Source: Department of Agriculture and Food Security of East Java province, 2016.

Result of maize market integration analysis. The data stationary tests. A time series data needs to be tested by stationary test so that it can be known whether stationary or not stationary. If the data contains the root unit, then it can be said that data are not stationary. Stationary tests on using Augmented Dickey-Fuller (ADF) test, with the test results of stationary in level can be seen in table 4.

Table 4 – Stasionarity Test Results at Level with ADF tests

Variable	ADF test in level			
	Critical Value 5%	ADF Statistic	p-value	stationary
Producer price	-2,892200	-1,296921	0,6285	Not stationary
Wholesaler price	-2,892200	-1,121755	0,7046	Not stationary
Consumer price	-2,892200	-1,365536	0,5960	Not stationary

Source: secondary data (re-make), 2017.
Error tolerance (α) 5%

Table 4 above shows that test results of stationary test in level mind that results ADF statistic $\leq$ ADF critical values and the value of the probability $> \alpha$ (0.05) then concluded that the data are not stationary. The results showed that at levels, the hypothesis H_0 is accepted, i.e. the data time series contain the root unit, means that the data is not stationary.

The Data that is not stationary needs to have differentiation to be used as a stationary data. This is useful to avoid spurious regression problems (pseudo) that may arise from the result of data time series regression that are not stationary (Ghozali and Dwi, 2013). Therefore, the time series data that are not stationary in level has done the Augmented

Dickey-Fuller test on the next level, i.e. at the level of the first difference. Stationary tests results at the level of the first difference are shown in table 5.

Table 5 shows that the stationary test results at level of the first difference noted that ADF statistic $\geq$ ADF critical values and the value of the probability $< \alpha$ (0.05) then inferred that the data is stationary. The results show that at level of the first difference, the hypothesis H_0 is rejected, time series data does not contain a root unit, means that the data is stationary. Based on these results, it can be inferred that all the variables of data used are stationary in the same order of order I (1) and the data were avoided from spurious regression. So, it can be extended by performing variables regression that are used for the purposes of co-integration test.

Table 5 – The result of stationary test in level of first difference using Augmented Dicky-Fuller

Variable	ADF test in level			
	Critical Value 5%	ADF statistic	p-value	stationary
Producer price	-2,892536	-9,638716	0,0000	stationary
Wholesale price	-2,893230	-6,817987	0,0000	stationary
consumer price	-2,892536	-9,509322	0,0000	stationary

Source: secondary data (re-make), 2017.

Error tolerance (α) 5%

Result of optimal lag selection. According to Kozhan (2010), the optimal lag length is used so that the residual each Vector Auto-regression (VAR) equation is free from the problem of normality and autocorrelation. In this study, the criteria which were used to determine the optimum lag length are the Acaice Information Criteria (AIC). The optimal lag test results are shown in table 6.

Table 6 – Results of Optimal Lag test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1698.389	NA	1.25e+13	38.66793	38.75238	38.70195
1	-1567.310	250.2409	7.78e+11*	35.89342*	36.23123*	36.02951*
2	-1564.299	5.544149	8.92e+11	36.02952	36.62070	36.26769
3	-1558.231	10.75616	9.55e+11	36.09616	36.94071	36.43641
4	-1547.190	18.81955*	9.15e+11	36.04978	37.14769	36.49210
5	-1538.858	13.63545	9.35e+11	36.06494	37.41622	36.60934
6	-1535.154	5.807226	1.06e+12	36.18533	37.78997	36.83180
7	-1526.672	12.72416	1.09e+12	36.19708	38.05508	36.94562
8	-1521.896	6.837628	1.22e+12	36.29309	38.40446	37.14371

Source: Secondary data (re-make), 2017.

Table 6 above shows that the optimal lag tests results using the Acaice Information criterion (AIC) is 35.89342 which are the smallest value of other criteria and at a lag of one, so the results lag of one is used as a the optimal lag length. The use of a lag as the optimal lag model means that the economy shows that all variables in the model is in the interplay, i.e. not only on this period, but the price variables mutually affected to the previous period. The value of the variable can be a lag effect on other variables. Because It takes time For a variable to be able to respond the movements of the other variables. After knowing the selection of the lag order of VAR model, then further testing is done by co-integration using Johansen model with the optimal lag length of one.

Result of Johansen co-integration test. Result of Johansen co-integration test between producer and wholesaler. Johansen Co-integration tests analysis of time series data of monthly price of maize at producer and wholesale level showed no cointegration result based on trace statistic (12,91068) <critical values 5% (15,49471) or max-eigenvalue (10,47414) <critical value 5% (14,26460) and probability value greater than 5%. That is, in the long run there is no balance between the price of maize at the producer level and the price of maize at the wholesale level. The absence of co-integration of maize prices means in the long run the producer market and wholesale markets are not integrated.. The integration of markets

that do not occur would be detrimental to the side of the producers, because price changes in wholesale level are not transmitted to the price at the level of the producers. No occurrence of transmission rates in the long term of market shows that between the producer and the wholesale market does not run efficiently or inefficiency marketing in the long run. The efficient market is the market which is its securities price quickly and fully reflects all the information that exists in the presence of its assets (Jones, 1995). Johansen Co-integration Test results for producers and wholesale market can be seen in table 7.

Table 7 – The result of Johansen Co-integration Test of maize prices variable at the level of wholesaler

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	12,91068	15,49471	0,1181	10,47414	14,26460	0,1826
At most 1	2,436543	3,841466	0,1185	2,346543	3,841466	0,1185

Source: secondary data (re-make), 2017.

Note: *significance α (0.05)

The next test for the maize prices variable at the producer and the wholesale level is a Vector Auto-regression first difference (VARD) test, because both of these variables are not stationary at level, but stationary are at the level of first difference and not co-integrated. VARD Test is required to see the balance of the short-run between two variables prices.

Result of Johansen co-integration test between producer and consumer Johansen Co-integration tests analysis of time series data of maize monthly price at producer and consumer level showed no co-integration result based on trace statistic (14.29980) < critical value 5% (15,49471) and max-eigenvalue (12,12511) < critical value 5% (14,26460) and probability value greater than 5%. That is, in the long run there is no balance between the price of maize at the producer level and the price of corn at the consumer level. No occurrence of maize prices co-integration indicates that in the long term producer and the consumer market would not be integrated. No occurrence of transmission rates in the long term show that between producers and consumers market do not run efficiently or inefficiency occur marketing in the long run. Result of Johansen co-integration tests for price at the producers and consumers market can be seen in table 8.

Table 8 – Johansen Co-integration Test Results for Variable of maize Price at Producer and Consumer Level

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	14,29980	15,49471	0,0751	12,12511	14,26460	0,106
At most 1	2,174695	3,841466	0,1403	2,174695	3,841466	0,1403

Source: secondary data (re-make), 2017.

Note: *significance α (0,05)

The next test for the variable price of maize at the producers and consumers levels is a VARD test, because both of these variables is not stationary at level, but stationary at the first difference and not co-integrated. VARD Test is required to see the balance of the short-run between those two price variables.

Result of Johansen co-integration test between wholesaler and consumer. The analysis of the Johansen co-integrated test to the data time series of maize's monthly prices on the wholesaler and consumer levels shows the results there is no co-integration were based on either trace statistics or max-eigenvalue is less than the critical value of 5% as well as the value of the probability of greater than 5%. That is, in the long term there is no balance between the price of maize at the wholesale and consumer levels. No occurrence of maize prices co-integration means that in the long run prices in the wholesale and consumer markets are not integrated. No occurrence of transmission rates in the long run shows that between wholesale and consumer market would not run efficiently or inefficiency marketing

in the long run. Johansen co-integration test results for the price in the wholesale market and consumers can be seen in table 9.

Table 9 – Johansen Co-integration Test Results for maize Price at wholesale and Consumer Level

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	14,04119	15,49471	0,0818	11,61922	14,2646	0,1258
At most 1	2,421968	3,8414166	0,1196	2,421968	3,841466	0,1196

Source: secondary data (re-make), 2017.

Note: *significance α (0,05).

Based on Table 24, the value of trace statistic (14.04119) <critical values 5% (15.49471) and max-Eigen statistic value (11.611922) <critical value 5% (14.2646), means that there is no co-integration between the price in wholesale markets and consumer markets. The next test for maize price variables at the wholesale and consumer levels is the VARD test, since the two variables are not stationary at the level, but stationary at first difference and un-integrated. The VARD test is needed to see the short-run balance between the two price variables.

Result of Granger causality test. Granger Causality tests is done to see the influences between variables. Although co-integration test shows variable of prices in each market level that is not co-integrated, but need to be further analyzed using the test of Granger Causality to see relationships between the Agents of marketing. Granger Causality tests results conducted in this study are shown in Table 10.

Table 10 – The result of granger causality tests of maize price on producers, wholesalers and consumers

Null Hypothesis:	Obs	F-Statistic	Prob.
CONSUMER_PRICE does not Granger Cause WHOLESALER_PRICE	94	1.19490	0.3075
WHOLESALER_PRICE does not Granger Cause CONSUMER_PRICE		2.62404	0.0781*
PRODUCER_PRICE does not Granger Cause WHOLESALER_PRICE	94	1.54138	0.2197
WHOLESALER_PRICE does not Granger Cause PRODUCER_PRICE		0.75840	0.4714
PRODUCER_PRICE does not Granger Cause CONSUMER_PRICE	94	4.66433	0.0118*
CONSUMER_PRICE does not Granger Cause PRODUCER_PRICE		0.49885	0.6089

Source: secondary data (re-make), 2017.

Note: *significance level of 10%.

Granger Causality tests for variable of maize price are done by comparing the value of the probability on the significance level of 10%. If the value of the probability exceeds the real level, then H0 is rejected. If the value of the probability is less than adequate for real, then H0 are received. In this study, the zero hypothesis (H0) is about a none relationship of mutual influence the two markets that are compared, and the alternative hypothesis (H1) are having none relationship between the two markets influence each other that is compared.

Granger Causality tests results show that the statistic value of F and probability on wholesaler and consumers are one way causality, i.e. the price at the level of wholesale prices is affected by the price at the consumer level ($\alpha < 0.1$), but prices at the consumer level is not influenced by prices at the wholesale level. Similarly, on the results of the analysis of the relationship of prices at producers and consumers level is at the level of prices, there is a relationship of one way causality, i.e. the price at the level of producers affected prices on the consumer level ($\alpha < 0.1$), but prices at the consumer level is not influenced by prices at the level of the producers. However, the relationship between price at the producer level and at wholesale level showed the results of the relationship between the two markets which are independent or does not influence each other.

Result of VARD test. VAR Tests conducted in this research using the VARD tests, for some reason the whole price data that used as the variable was not stationary at the level,

but stationary at the level of the first difference, and the entire data variables in the test results show that none co-integration between variables. Although in the long run between those markets are not integrated, but in the short-term the possibility of integration that occurs can be evaluated through Vector Auto-regression approach in the form of the first difference. So in the VAR test is done with the VARD test.

Maize price formation on the consumer level based on the estimation results of the VARD above, the increase of IDR 1.000, 00 sale price on the consumer level of the previous two months causing the increase of selling cost as much as IDR 85 at this time and causing a decrease in selling price three months earlier of IDR 369, 00 at the level of wholesale. As well as causing a decrease in selling price at the level of producers on the previous three months of IDR 81,00.

The formation of the maize price on the wholesale level based on the estimation results of the VARD above, the increase of IDR 1.000, 00 selling price at wholesale levels cause a decrease in selling price at the consumer level in previous three months IDR 11, 00 and increase the selling price at the producer level in two months earlier of IDR 5, 00 for now and previous three months amounted to IDR 33, 00.

maize price formation on the producers level based on the estimation results of VARD above, the increase of IDR 1.000, 00 selling price on the producer level led to a decrease in selling price at the consumer level on the previous three months IDR 11, 00 and led to a rise of selling price at the wholesale level two months earlier of IDR 1, 00 and prices three months earlier was as much as IDR 278, 00.

Table 11 – The estimation result of VARD models in producers, wholesaler, and consumer market during 2009-2016

	Consumer Price	Wholesaler Price	Producers Price
CONSUMER PRICE(-1)	0.488407 (0.20598) [2.37111]	0.099097 (0.14650) [0.67645]	0.072582 (0.15752) [0.46079]
CONSUMER PRICE(-2)	-0.080996 (0.21930) [-0.36934]	-0.106467 (0.15597) [-0.68262]	-0.106236 (0.16770) [-0.63349]
CONSUMER PRICE(-3)	0.127838 (0.19891) [0.64268]	-0.010608 (0.14147) [-0.07499]	-0.010990 (0.15211) [-0.07225]
WHOLESALE PRICE(-1)	0.337956 (0.32578) [1.03739]	0.700708 (0.23169) [3.02429]	0.313920* (0.24912) [1.26010]
WHOLESALE PRICE(-2)	0.084941 (0.35676) [0.23809]	0.124262 (0.25373) [0.48974]	0.000582 (0.27282) [0.00213]
WHOLESALE PRICE(-3)	-0.369568 (0.31668) [-1.16701]	-0.081378 (0.22522) [-0.36132]	-0.277654 (0.24217) [-1.14654]
PRODUCER PRICE(-1)	0.388443 (0.33973) [1.14340]	0.208144 (0.24162) [0.86147]	0.628923 (0.25979) [2.42088]
PRODUCER PRICE(-2)	0.229726 (0.36519) [0.62905]	0.005318 (0.25973) [0.02047]	0.109379 (0.27926) [0.39167]
PRODUCER PRICE(-3)	-0.080675 (0.34007) [-0.23723]	0.032852 (0.24186) [0.13583]	0.222758 (0.26006) [0.85658]
C	201.9482 (185.554) [1.08835]	222.2785 (131.967) [1.68435]	189.7272 (141.894) [1.33710]

Source: secondary data (re-make), 2017.

Note: digits inside the [] is t-table value, digits inside the () is t-statistic value.

On the relationship of long-term equilibrium of the price at the consumer level is not affected by prices at the wholesale level, as well as on the price at the consumer level is not affected by the price at the producer level. This indicates that no transmitted price changes from the consumer market to the wholesale and producer market. But on short term relationships between variables are the price of maize in the wholesale level, as well as at

producer level were affected by the price of maize at the consumer level. This indicates the presence of short-term integration between wholesale and consumer prices, with consumer prices with the producer price.

CONCLUSION AND RECOMENDATIONS

Fluctuations in maize prices indicate producer prices, wholesale prices, and consumer prices are low fluctuating, Integration of the maize market between the prices in the producer and wholesale markets, between prices in the wholesale and consumer markets are integrated in the short-term but not in the long run. The government needs to evaluate the maize market information system so that corn market integration can be well-running and farmers / producers enjoy their maximum selling price.

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