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ANALYSIS OF ASYMMETRIC PRICE TRANSMISSION IN THE NAGAN RAYA DISTRICT'S RICE MARKET

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ABSTRACT
Asymmetric price on the rice marketing is a crusial problem and often occurs in the process of distribution from the farmers to consumers. This research aim to analyze the asymmectric price on the rice marketing of Nagan Raya District by using the quantitative testing with asymmetric price transmission theory approach done by using the Error Correction Model (ECM). The results show that in the short term the price of GKP at the farmers level with the price of rice at the end consumers level is asymmetrical, while in the long term is symmetrical.

KEY WORDS
Asymmetric price, rice, Error Corection Model, policies, farmers.

Indonesia is the third largest rice producing country in the world. But even though Indonesia occupies that position, Indonesia still rely on rice needs from other countries, such as Vietnam, Thailand, United States of America and Taiwan. Vietnam is one of the largest rice importing country from 2000 to 2015. On the 2011, Government does rice import policy (Kompas online 2011), as for the purpose of determining rice import policy in the year to maintain domestic rice stock.

In the Aceh province, rice commodity is also an important commodity for the community. Therefore, the level of availability should be a major concern for the government. Availability of rice is inseparable from harvested area and rice production.

Harvested area and rice production in the Aceh province from 2005 to 2014 experienced a highly fluctuating development. Which the highest growth of rice harvest occurred in 2007 that was 12,45 percent and the production rate growth 13,52 percent while the lowest growth of harvested area occurred in the 2018 that is equal -8,76 percent while the production rate growth of -8,55 percent, this situation is almost same occurred in the 2014. It will very affects the amount of rice produced so that it will affects the price of rice that is formed.

Asymmetric price problems are also felt by the people of Aceh, such as the difference between the price of retailers at the price received by farmers. Farmers expect high rice prices but consumers expect low rice prices. This condition causes the government to set a policy so that the price of rice can be controlled to be not too high that can side with the consumer, and the price of rice is not too low so that farmers can experience profits.

Of the 23 districts in Aceh Province, Nagan Raya District is one of the districts that produce large amount of rice. On the 2014, the area of paddy field in Nagan Raya Regency amounted to 33242.38 Hectares with total production of 153458.9 Ton. This illustrates that most of the inhabitants are livelihoods of paddy rice.

For rice paddy farmers in Nagan Raya District, the price asymmetric problem is also a crucial problem and often encountered in the marketing process. Asymmetry of a large price will lead more inefficient market. This will harm farmers as producers and communities as consumers. This means that income losses will occur at the farm level and expense losses will occur at the consumer level. Asymmetrical transmission is important to see how much

asymmetric level that occurs between the price at the farmer level and the final consumer price level.

This research aims to analyze whether the price on rice marketing at farmers and end consumers is asymmetrical?

METHODS OF RESEARCH

The location of this research is located in Nagan Raya District. Data used in this research is time series data that is monthly GKP data from January 2011 until December 2015 and monthly rice price data at retailer level.

Data processing in this research used Error Correction Model (ECM) method developed by Granger lee et al (1989).The first stages in this analysis are:

Stationary test. The stationer test data used Augmented Dickey Fuller test (ADF). The formulation of the ADF test model is:

$$\Delta x_t = a_0 + \gamma x_{t-1} + \sum_{i=1}^{p} a_1 \Delta x_{t-i+i} + \varepsilon_t$$

Where: $\Delta x_t = x_t - x_{t-1}$, t is the time period, γ and a_i are the model coefficients, whereas ε_t is the model error. The statistical hypothesis tested is Ho: γ =0 (time series data x_t is not stationar y), H_1: $\gamma \neq 0$ (time series data is stationary). Non-stationary data is further distasionerized through a differentiation process, which can be done several stages until the end result obtained a stationary data pattern.

Cointegration test. This test is used if the data is not stationary at the level, with the following formula:

$$\Delta P_t = c + \Pi P_{t-1} + \sum_{j=1}^{k-1} B_j \Delta P_{t-j} + \varepsilon_t$$

The statistical hypothesis tested is H_0: rank = r; H_1: rank > r. For that used the following test statistic:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} \ln(1-\lambda_i)$$

or

$$\lambda_{\max}(r, r+1) = -T \ln(1-\lambda_{r+1})$$

Where: K = 0.1, ..., n-1; T= Number of observations used; λ_i = Estimate the value of the eigenvalue order of the matrix Π; r = Number of vectors of cointegration vector in null hypothesis.

The null hypothesis used in λ_{trace} and λ_{max}, tests, namely:

H_0: r ≤ 0 or there is no cointegration relationship

H_0: r ≤ 1 or at most one cointegration equation

H_0: r ≤ n-1 or at most n-1 cointegration equation

If the statistical test is greater than the critical value in the Johansen table then H_0 is rejected, it means there is a cointegration relationship.

Causality Test. This test used the Granger method, to prove whether GKP price movement at the farm level is the main determinant of rice price movement at the retailer level or vice versa. The 2 (two) asymmetric equations that will be used in this research, namely:

$$\Delta PP_t = a_0 + \sum_{i=1}^{n} \beta^{-}{}_{PP} \Delta PP^{-}_{t-i} + \sum_{i=o}^{n} \beta^{-}{}_{PE} \Delta PE^{-}_{t-i} + \pi_1 Z^{-}_{t-1} + \sum_{i=1}^{n} \beta^{+}{}_{PP} \Delta PP^{+}_{t-i} + \sum_{i=0}^{n} \beta^{+}{}_{PE} PE^{+}_{t-i} + \pi_2 Z^{+}_{t-1} + \varepsilon_t$$

$$\Delta PE_t = a_0 + \sum_{i=1}^{n} \beta^{-}{}_{PE} \Delta PE^{-}_{t-i} + \sum_{i=o}^{n} \beta^{-}{}_{PP} \Delta PP^{-}_{t-i} + \pi_1 Z^{-}_{t-1} + \sum_{i=1}^{n} \beta^{+}{}_{PE} \Delta PE^{+}_{t-i} + \sum_{i=0}^{n} \beta^{+}{}_{PP} PP^{+}_{t-i} + \pi_2 Z^{+}_{t-1} + \varepsilon_t$$

Where: PP_t = Price of GKP at farmer level period t(Rp / Kg); E_t = Price of rice at consumer level period t (Rp / Kg); a_0 = Intercept; P = Length of lag; Z_{t-1} = Error correction term; ε_t = Error term.

RESULTS OF STUDY

Asymmetric Price Transmission of Unripe Rice Harvest and Rice in Nagan Raya District. The testing stages in the asymmetric price transmission analysis are as follows.

Stationary test is the first step in the Asymmetric analysis step to know in advance whether the time series data we use is constant or not. Conversely, if time series data is not stationary it will causes spurious regression, in this research stationary test time series data by used Augmented dickey-Fuller Unit Root Test (ADF) with 5% real level. Here the results of stationary test on the dry prawn harvest price data at the farm level on conditions Level.

Table 1 – Static Test Results GKP Data at Level Conditions

Null Hypothesis: PETANI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.866806	0.0040
Test critical values:	1% level	-3.546099	
	5% level	-2.911730	
	10% level	-2.593551	

**MacKinnon (1996) one-sided p-values.*

Table 2 – Test Results of GKP Stationary Data on First Difference Conditions

Null Hypothesis: D(PETANI) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.187962	0.0000
Test critical values:	1% level	-3.574446	
	5% level	-2.923780	
	10% level	-2.599925	

**MacKinnon (1996) one-sided p-values.*

Table 3 – Stationary Test Result of Rice Price Data at Level Condition

Null Hypothesis: KONSUMEN has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.277368	0.9751
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

**MacKinnon (1996) one-sided p-values.*

Based on the above table seen the test results that GKP price variable at the level of producers or farmers have stationer at level conditions. But the difference in value is very slim, therefore for the data to produce more accurate results then the data tested again at first difference level by used ADF test. The test results on these conditions are obtained as follows in Table 2.

Based on table 2 above, the test results obtained at first difference conditions obtained GKP price data has been stationary, meaning GKP price data there is no root unit. Furthermore, stationary testing using ADF test is also conducted on the price of rice at the retailer level. The results obtained are as follows in Table 3.

Based on the first test conducted on rice price data at the Retailer level at the level obtained the same results as the test conducted on GKP price data at the farm level, which is the data presented is not stationary. The next stage is done on the first difference test. The results obtained from the test can be seen in table 4 below.

Table 4 – Stationer Test Results of Rice Price Data on First Difference Conditions

Null Hypothesis: D(PETANI) has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.187962	0.0000
Test critical values:	1% level	-3.574446	
	5% level	-2.923780	
	10% level	-2.599925	

**MacKinnon (1996) one-sided p-values.*

In the above conditions we can see that the value of ADF statistics is -9.187962. From the results of test data of rice prices at the consumer level is declared stationary. The data is declared stationary so the null hypothesis is rejected. Therefore the next step can be done next testing stage is cointegration test.

Cointegration Test. Cointegration test conducted in this research is cointegration Johannsen cointegration test. In this test seen from the value of trace statistic (TS) and max-eigenvalue statistic (ME) to t-statistic value. The results of the Johanssen cointegration test can be seen in the following table.

Table 5 – Cointegration Test Results on GKP Price Data at Farmer Level and Rice Price at Consumer Level in Nagan Raya District

Sample (adjusted): 4 60
Included observations: 57 after adjustments
Trend assumption: Linear deterministic trend
Series: KONSUMEN PETANI
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.399608	29.08649	15.49471	0.0003
At most 1	0.000117	0.006648	3.841466	0.9344

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

From the table above cointegration test results can be explained that GKP price data and rice price data cointegrated, this means that both series of price data has a long-term equilibrium relationship. This is in line with Muhammad's statement.M (2014) cointegration is one method to indicate the possibility of a long-term equilibrium relationship between the dependent variable and independent variable, but in the short term it can also not experience an equilibrium relationship.

Causality Test. The test of causality is done to find the causal relationship between variables that affect the change of other variables. Here is the result of causality test by used Granger test.

Table 6 – Result of Causality Test with Granger test method

Pairwise Granger Causality Tests
Sample: 1 60
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
PETANI does not Granger Cause KONSUMEN	58	4.83830	0.0117
KONSUMEN does not Granger Cause PETANI		1.85888	0.1659

From the test of causality it can be concluded that causality occurs only one direction. It means that only GKP price growth at the farm level affects the price of rice at the consumer level. However, if the price of rice increases, the price growth does not affect the price of GKP at the farm level. This statement is used with attention to Prastowo et al's research (2008 in Yustiningsih, 2012) suggesting that rice prices at the consumer level tend to be stable unless there is a disruption from supply angle such as crop failure, distribution disturbance and rice import policy.

Asymmetric Model Test. Based on the results obtained shows that there is a difference in the speed of adjustment response between the price level of farmers with prices at consumer level. For rice price variable at consumer level at the time of the decline indicates that value is not significant while at the moment of change of price increase in two previous period showed significant value. This means that the rice price at the consumer level in the period t is only affected by the price of grain in the previous two periods, while the decline in grain prices in the previous two periods did not affect the price of rice at the consumer level in the period t. This is possible because rice sold to consumers by traders is old stock rice. In this case seen the existence of storage systems made by traders. So when there is a decrease in rice price one period before traders do not necessarily respond to price decline in period t. From the estimation of the above model can be seen ECT_plus and ECT_neg show the value of coefficient is negative value, meaning that the deviation that occurs will return the balance of equilibrium (wixson and katchova, 2012) where the coefficient value ECT_plus (-0.073308) is a condition of deviation above the equilibrium line when the price of GKP decreases at the farm level is not followed by the decline in rice prices at the consumer level. However, at certain time the rice price at the consumer level will follow the change of such deviation. The length of time of adjustment is after one month, this can be seen from the coefficient value ECT_plus. However, because the value is not significant then the deviation does not affect the rice price at the consumer level. While the value of ECT_neg (-0.010783) is a condition of deviation when it is below the equilibrium line mean when GKP price rises at a cer tain period rice price at consumer level does not experience change of increase but at a certain period of rice price will follow price increase of GKP. The length of time to adjust the price of rice to the consumer following the GKP price is more quickly responded than at the time of the price decline at the farmer level. It can be seen from ECT_neg coefficient value of -0.010783.

CONCLUSION

Based on the test that has been done then it can be concluded that the transmission price of GKP at the level of farmers with rice prices consumer level in Nagan Raya district is asymmetrical in the short term while in the long term is symmetrical. This can be seen from:

- The cointegration test shows that the trace value of statistic is greater than the value of the critical value at the 5% level, the GKP price data and the cointegrated rice price data, this means that in the long run the series of price data (GKP price at the farmer level with rice price at consumer level) long-term.
- The causality test shows the results obtained on the slowness 2 GKP price at the farm level affects the consumer rice price at α = 5%, but the rice price at the consumer level does not affect the price of GKP at the farm level. It means that causality occurs only one direction, namely the price of GKP that affects rice price at the consumer level.

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