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Analysis of Indonesian and Chinese Garlic Volatility Prices

Marina Ayuningtyas*[1], Sri Hartoyo[2], Sri Mulatsih[3]
*[1]Department of Economics, IPB University, Bogor, Jawa Barat, Indonesia
[2,3]Lecture, Departement of Economic, Economic and Management Faculty, IPB University, Bogor, Indonesia

ABSTRACT

The need for garlic consumption in Indonesia tends to increase without being matched by increased production, which causes Indonesia to import garlic by 95 percent of total domestic needs. Garlic imports tend to increase, causing the price of local garlic to be higher than the price of imported garlic, so consumers prefer imported garlic products over local garlic products. This causes farmers to face the risk of uncertainty (unpredictable) on prices, where price fluctuations are difficult to predict. In order to cope with price fluctuations and to maintain food price stability that remains accessible to consumers, it is necessary to conduct research on the analysis of the price volatility of garlic, so that price uncertainty can be overcome. This study aims to analyze price volatility in the garlic market in Indonesia and China using time series price data between January 2012 and September 2019. The method used is the ARCH/GARCH model. The results showed price volatility at producer level, imported garlic retailers, and the world market (China).

Keywords: Garlic, Price, Volatility, ARCH/GARCH

I. INTRODUCTION

Horticulture is one of the agricultural sub-sectors that has an important role in contributing to Indonesia's GDP as much as 1.49 percent of total GDP during the 2012-2016 period (BPS, 2017). Garlic is a type of horticultural commodity with high economic value because of the benefits. Besides as a flavouring agent, garlic can be used as medicine that can cure various diseases (Wijaya 2014). In line with increasing of population, the community's need for garlic also continues to increase.

The availability and increase of garlic production is important to note, because for the past 5 years, the average production of garlic in Indonesia is low yet when compared to other countries that also produce garlic, such as China. According to Jumini (2008), there are several causes of garlic production decreasing, one of the factor is the decreasing number in harvested area that give impact in production of garlic itself (Table I). In addition, the liberalization of trade also causes slumped production of garlic. The existence of trade liberalization, indirectly establish policies that made by government related to garlic imports activity which can be considered as threat regarding sustainability of the domestic garlic farming business because imported garlic was tends to increase every year.

The increasing amount of imported garlic provide higher price of local garlic in market. Therefore, the consumers prefer purchase imported garlic over local garlic (Permana 2006). If this phenomenon occur continuosly, the farmer will lose incentive to continue producing. Another assumption that can be emerge is some farmers will establish low price garlic with low quality to be able to compete with imported garlic (Rinihapsari 2000). Furthermore, the continuity of imported garlic can also cause farmers to face the ncertainty (unpredictable) prices, where price fluctuations is difficult to predict (Amri 2011). The amount of the price that goes up or down becomes uncertain or difficult to estimate. Generally, farmers also can not adjust the selling time to get a profitable selling price, so that this circumtances generate detrimental for farmers.

Actually, the government through the Ministry of Trade has made a reference price for garlic, but the regulation is not set forth in the form of a Minister of Trade Regulation or other written regulation. However, the Ministry of Trade through the Food Task Force has begun to conduct surveillance in each region to socialize prices the garlic reference. Meanwhile in reality, the policy that made by the Ministry of Trade is ineffective on maintaining the price stability of garlic because the price fluctuation. Therefore to maintaining price stability and accessible food prices for consumers, an appropriate policy from government is really needed. Firdaus and Gunawan (2012) states that the ability of governments to make appropriate pricing policies is determined by how deep the policy makers understand the market.

Based on explanation above related to the importance role of garlic and the price uncertainty of garlic as main problem, this proves the research necessity towards price volatility analysis of garlic, so that the price uncertainty can be solved. The necessity of price volatility measurement was intended to mapping the uncertainty. In this case, this measurement relatable by analyzing the volatility of garlic prices, farmers will find out about direction, size, and size of price fluctuations and also farmers can find out in which level of uncertainty will be borne in scope of price alternation at market (Wihono 2009). Thus, the aims of this research is to analyze the garlic price volatility of Indonesia n and World (China).

II. METHODS AND MATERIAL

The type of data that used in this research is secondary data of monthly time series data from January 2012 to September 2019, including price data in producer level, retail level which are divided into price of imported garlic, price of local garlic, and world prices that refer to Chinese market. Data was obtained from several sources such as UN Comtrade and the Ministry of Agriculture Director General of Horticulture.

Data analysis methods were used descriptive analysis methods and quantitative analysis methods. Descriptive analysis method was used to provide an overview of price development, production development, and garlic consumption between January 2012 to September 2019. Meanwhile the quantitative analysis method with ARCH/GARCH model by the help of EVIEWS 9 was used to figure out the volatility of Indonesian garlic prices towards China.

ARCH/GARCH Model

Time series economic data generally have a fairly high level of volatility. The development of agricultural commodity prices such as garlic is greatly influenced by weather alteration. The difficulties to predict climate change patterns and climate change is one of many impact on commodity price movements that volatile and difficult to predict. In addition, other factors can also triggers the fluctuations of garlic price such as alteration in consumption patterns, policies, and changes in prices for other commodities that directly or indirectly influence the development of garlic prices.

Models that can be used to analyze the volatility of garlic price development is *Autoregressive*

Conditional Heteroscedasticity (ARCH) and *Generalized Autoregressive Conditional Heteroscedasticity* (GARCH). The ARCH model was first developed by Engle (1982) which assumes residual variants for inconstant of time series data or contain heteroscedasticity. The basic form of the ARCH model can be explained as follows (Widarjono 2013):

$$Y_t = \beta_0 + \beta_1 X_t + e_t \quad (1)$$

Where, Y_t is the dependent variable; X_t is an independent variable; and e_t are interference or error variables.

In general, the type of time series data tends to have a variant of error term which is constant over time or homoscedastic. However, the high volatility in time series data can cause the residual variants of the data to be inconstant and change from one period to another period, or contain an element of heteroscedasticity. Heteroscedasticity occurs because the time series data shows the element of volatility, the variance of the disturbance variable from the model will depend on disturbance variable volatility of previous period or in other words, the variance of disturbance variable is strongly influenced by disturbance variable in previous period.

GARCH (*Generalized Autoregressive Conditional Heteroskedasticity*) model is an improvement of the ARCH model which developed by Bollerslev in 1986. The GARCH model states the variance of the disturbance variable is not only influenced by the disturbance variable in the previous period, but it's also influenced by variance of interruption variable of previous period. Then, the equation for variance of interference variable with GARCH model can generally be written as follows:

$$h_t = K + \delta_1 h_{t-1} + \delta_2 h_{t-2} + \ldots + \delta_r h_{t-r} + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 + \ldots + \alpha_m \varepsilon_{t-m}^2 \quad (2)$$

Where, h_t is the price variable of garlic at time t, or the variance at time t; K is a constant variance; ε_{t-m}^2 is the ARCH term or volatility in the previous period; $\alpha_1, \alpha_2, \alpha_m$ are estimated order m coefficients; $\delta_1, \delta_2, \delta_m$ are estimated order r coefficients; and h_{t-r} is the GARCH term or variance in the previous period.

Similar to the ARCH model, the GARCH model cannot be estimated by the OLS (*Ordinary Least Square*) method, but it's use ML (*Maximum Likelihood*) method. The main purpose of using ML method was to detect the presence of heteroscedasticity or the ARCH element in the regression model, the two methods can be used by: (i) knowing the pattern of quadratic disturbance variables from the Correlogram; and (ii) ARCH-LM test. Basically, the presence or absence of the ARCH element can be seen from the correlogram of the squared residual. If the value of the *Autocorrelation Function* (ACF) and *Partial Autocorrelation Function* (PACF) are zero at all levels of lags, or not statistically significant, then there is no ARCH element. Another method for detecting ARCH elements is the ARCH-LM test. If the probability of value (p-value) is smaller than α (5%), then the result is reject the null hypothesis, or in other words the model used contains ARCH elements.

Based on Sumaryanto (2009), there are at least five stages in the volatility measurement procedure using the ARCH/GARCH method:

1. Data Identification

The purpose of data identification in this stage was to find out about heteroscedasticity. Heteroscedasticity test is done by ARCH-LM test. The ARCH-LM test based on null hypotesis if there was zero ARCH error. Meanwhile the data was homoscedasticity and no need to be modeled based on ARCH if there was no acceptable hypothesis.

2. Parameter Estimating

Parameter estimating test process used various models by utilized average model that has been obtained. The next phase was model parameter values forecasting to determine the optimum model of ARCH/GARCH. Main purpose of parameter forecasting was to find out the most suitable model coefficient for data. This testing phase was done in iterative way by Algoritma Marquardt.

3. Best Model Selection

The best model selection was approached based on best size of large model and tangible model when selecting the greatest model. The second approach was to look the value of *Akaike Information Criterion* (AIC) and *Schwartz Criterion* (SC). The best model was chosen based on the smallest values of AIC and SC of significant model.

4. Model Adequacy Check

Jarque Bera (JB) normality test is performed to check normality of model's standard residuals. This testing phase was also to ensure that the used model is a great model. A great model determined by residual deployment of model that happened normally. The difference between skewness and kurtosis of data from normal distribution, as well as incorporating a measure of diversity were also carried out in the JB test.

5. Forecasting with models

After an appropriate model is obtained, forecasting can be made for one or several future periods, in this estimation a confidence interval can be determined. Generally, the farther of forecasting the greater of confidence interval.

The ARCH/GARCH model that links the four markets of this research was:

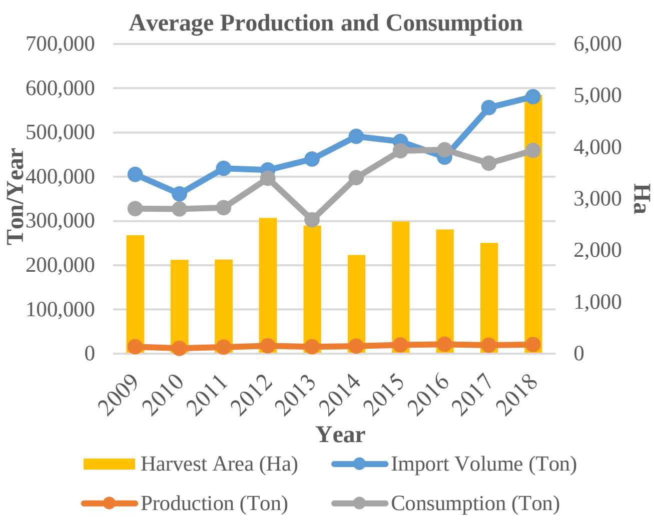
$$\sigma^2_{HPBPt} = \alpha_0 + \alpha_1 \varepsilon^2_{HPBPt-1} + \beta_1 \sigma^2_{HPBPt-1} \quad (3)$$
$$\sigma^2_{HLBPt} = \alpha_0 + \alpha_1 \varepsilon^2_{HLBPt-1} + \beta_1 \sigma^2_{HLBPt-1} \quad (4)$$
$$\sigma^2_{HIBPt} = \alpha_0 + \alpha_1 \varepsilon^2_{HIBPt-1} + \beta_1 \sigma^2_{HIBPt-1} \quad (5)$$
$$\sigma^2_{HDPBt} = \alpha_0 + \alpha_1 \varepsilon^2_{HDBPt-1} + \beta_1 \sigma^2_{HDBPt-1} \quad (6)$$

Where, σ_t^2 is the response variable (bound) at time t/conditional variance of squared residuals in the t-period; α_0 is a constant; ε^2_{t-1} 2 is the ARCH/volatility term in the previous period; α_1, β_1 is the estimated coefficient; σ^2_{t-1} is the GARCH/conditional variance term of the squared residuals of the previous period; *HPBP* is the price at the level of local garlic producers; *HLBP* is the retail price of local garlic; *HIBP* is the retail price of imported garlic; *HDBP* is the price of garlic on the world market (China).

III.RESULTS AND DISCUSSION

A. Development of Indonesian Garlic Production and Consumption

Based on diversity functions of garlic, number of garlic consumption tends to be increased. Meanwhile, this phenomenon was not simultaneous with garlic production in Indonesia. Based on Fig. 1, fluctuating growth occurs in garlic production. The positive growth of garlic production occurred between 2013-2016 and decreased in 2017, whilst the development of garlic consumption shows an escalation that occur every year. Based on this phenomenon, it shows that the existence of inequality. This imbalance incident indicate the large amount of garlic supply shortage, thus making the government imported garlic. The average growth rate of garlic production in Indonesia in last 10 years between 2009 and 2018 was negative at 0.825 percent, while the average growth of garlic consumption was 2.54 percent with an average production of 17,441 tons and an average consumption of 389,161 tons. This shows a deficit of 95.52 percent.



Source: Ministry of Agriculture, 2019

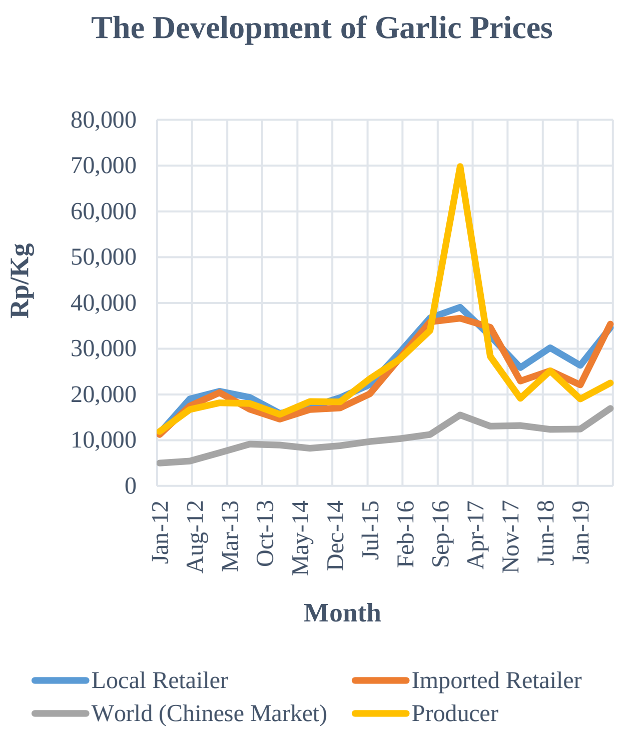
Figure 1. Average Production and Consumption

The alteration that occur in garlic production were strongly influenced by harvest area. In addition, the decreasing moment in garlic production was also influenced by low quality of garlic seeds, escalation number of garlic plants that attacked by diseases such as fungi and viruses, unoptimal environment for garlic plant's growth, and high forfeit of yield due to inadequate storage in postharvest session (Wibowo 2008). In addition, the degradation interest of Indonesia's garlic farmer in cultivating also become on of many factors that causes reduction in domestic garlic production. This happens because of the domestic garlic was inability to compete with imported garlic, especially garlic from China. Therefore, many garlic farmers change over to cultivate other vegetables which more profitable and able to avoid high risks (Asogiyan 2018).

The undeniable of trade liberalization was also one of many factors that causing garlic production in Indonesia continues to decreased and strengthened by the presence of Decree No. 355 of 2001 concerning Stipulation of ASEAN-China Imported Goods Import Duty Tariffs, Decree No. 356 of 2004 concerning China-Indonesia Bilateral Entry Rates, as well as government policies issued in Minister of Trade Regulation No. 16 / M-DAG / PER / 4/2013 concerning Provisions on the Import of Horticultural Products, such as the abolition system of imported garlic quota. Meanwhile the alteration that occur in garlic consumption were more influenced by Indonesia growth population, which the rate of population growth in Indonesia tends to increase every year. The increasing of Indonesia's GDP was also simultaneous with escalation of people's purchasing power, so that this expected to affect the escalation of Indonesia's garlic consumption.

B. The development of Indonesian and Chinese garlic prices

The growth progress of garlic prices can be seen in Figure 2. The development of garlic prices in world market, during January 2012 to September 2019 indicated stably increased at the level 4.984 rupiah/kg to 12.440 rupiah/kg in January 2019. The development of garlic prices in producer level tends to decrease, although in August 2016 it's experienced a very significant increase that reached 69.792 rupiah/kg and continued to decline. Price developments at the level of imported garlic retailers tends to be stable from level 11.217 rupiah/kg in January 2012 to 22.046 rupiah/kg in January 2019. Meanwhile the price development at the local garlic retailer level tends to be stable. However when comparaed the price between imported garlic retailers and local garlic retailer level is more expensive, namely 11.532 rupiah/kg in January 2012 to 26.318 rupiah/kg. Based on this phenomenon this occur situation that many consumers prefer to buy imported garlic compared to local garlic. The high price of local garlic it's also influenced by the large production costs incurred by farmers in conducting garlic cultivation. Whereas garlic imported from China has a much lower production cost.



Source: Ministry of Agriculture, 2019

Figure 2. Average Production and Consumption

C. Analysis of Indonesian and Chinese Garlic Volatility Price

The stages of identifying model determination were the stages before using ARCH / GARCH method. This stage includes stationary testing data and determining the ARIMA model to estimating parameters and selecting the best ARIMA model. So that the garlic data that used were firstly analyzed by using a stationarity test, so there was not contained biased data in estimated data. Stationarity test can be done in level, first difference, and second difference. The data stationarity test used in this study is the ADF (*Augmented Dickey Fuller Test*). If the ADF t-statistic value is smaller than 5% critical values, the data was stationary. Stationary test results contain garlic price at producer level, local garlic price at retail level, imported garlic price at retail level, and world garlic price and the determination of the best ARIMA model can be seen in Table I.

TABLE I. DATA STASIONERITY TEST AND ARIMA MODEL

Variable	ADF t-statistic	Critical Values (5%)	Prob*	ARIMA Model
Producer Price (HPBP)	-2.998643	-2.893230	0.0387	ARIMA (1, 0, 0)
Local Retail Price (HLBP)	-8.809619	-2.894716	0.0000	ARIMA (3, 2, 0)
Import Retail Price (HIBP)	-6.832947	-2.893589	0.0000	ARIMA (1, 1, 0)
World Prices (HDBP)	-8.522911	-2.896779	0.0000	ARIMA (4, 2, 0)

Note: *stationary level at 5%

Based on Table 1, it can be seen that the value of the ADF t-statistic at each level of garlic price was smaller than the critical value at the real level of 5%. So that, the price at each level price of garlic does not contain unit roots and the data is stationary. So the next stage was determining the ARIMA tentative model by looking at the pattern of *Autocorrelation Function* (ACF) which represents the MA and *Partial Correlation Function* (PACF) that represents AR. Then the ARIMA models that have been obtained were tested by comparing the smallest *Akaike Info Criterion* (AIC) criteria, the smallest *Schwarz Criterion* (SC), the smallest *Sum Square Resid* (SSR), and the largest Adjusted R-square. If the ARIMA models were not fulfill four criterias, then the solution was comparing the smallest *Akaike Info Criterion* (AIC) value.

After looking the pattern of *Autocorrelation Function* (ACF) and *Partial Correlation Function* (PACF), and compared to the criteria, the best model for Producer Price is ARIMA (1, 0, 0), which means the best model is AR (1) at the level. The best model for price at the local garlic retailer level is ARIMA (3, 2, 0) which means the best model is AR (3) at the second difference level. The retail price for imported garlic has the best ARIMA model (1, 1, 0) which means the best model is AR (1) at the first difference level. As for the best model in the world price, the ARIMA model (4, 2, 0) is obtained, meaning that the best model is AR (4) at the second difference level.

ARCH / GARCH Model Specifications

The results of ARIMA model probability test showed that garlic price at each level has a small probability value (close to zero). The next phase of testing is ARCH effect test. There wezre two events to find out the effects of ARCH on the best ARIMA models. First thing is to observe the Correlogram Squared Residual. If there was at least one significant Q-statistic value and its ACF and PACF values are significantly different from zero at a certain lag, then it can be said there was contain no ARCH/GARCH elements. The second thing was to check the residual of the best ARIMA model by looking at the *Lagrange Multiplier* (LM) value. This study uses a second way to see the presence or absence of the ARCH effect. The ARCH effect test results can be seen in Table II.

TABLE II. TEST OF THE EXISTENCE OF ARCH EFFECT

Variabel	F-statistic	Prob*	Presence or absence of ARCH effects
Producer Price (HPBP)	9.006546	0.0035	there is an ARCH effect
Local Retail Price (HLBP)	2.849513	0.0949	no ARCH effect
Import Retail Price (HIBP)	8.806332	0.0039	there is an ARCH effect
World Prices (HDBP)	4.398000	0.0389	there is an ARCH effect

Note: *stationary level at 5%

Based on Table 2 it can be seen that not all variables contain the ARCH effect. Variables which not contain ARCH effect automatically discontinued for ARCH/GARCH model estimation, price variable at the local garlic retailer level, this happens because probability value indicates greater than the 5% real level. While the variables containing the ARCH effect will be continued for the next stage estimation, which is the stage of determining the best ARCH/GARCH model. The model selection is carried out the same as the previous process is ARIMA model selection. But when determining the best ARCH/GARCH model, besides considering the lowest *Akaike Info Criterion* (AIC) value, the smallest *Schwarz Criterion* (SC), the smallest *Sum Square Resid* (SSR), and the largest Adjusted R-square, it must be consider coefficient value that must be significant, the coefficient value is not greater than one, and the coefficient value cannot be negative. Based on the testing that has been done by observing these criteria, the best ARCH/GARCH model is obtained from each variable that can be seen in Table III.

TABLE III. THE BEST ARIMA AND ARCH-GARCH MODELS

Variable	The Best ARIMA Models	The Best ARCH-GARCH Models
Producer Price (HPBP)	ARIMA (1, 0, 0)	ARCH (1, 0)
Import Retail Price (HIBP)	ARIMA (1, 1, 0)	ARCH (1, 0)
World Prices (HDBP)	ARIMA (4, 2, 0)	GARCH (1, 1)

Note: *stationary level at 5%

Based on Table III, the best ARCH/GARCH variance model is obtained. The best ARCH/GARCH model has been able to capture all the ARCH effects found in residuals. The measurement of volatility was indicated by the standard deviation value which the root of the estimated ARCH/GARCH model variance. The next stage was normality error test by observing the Jarque-Bera probability value that can be seen in table IV. Based on the results of the Jarque-Bera normality test, the probability of all variables shows was smaller than the real level of 5%, so this showed abnormal distributed data. Meanwhile to overcome the error abnormality was using Heteroscedasticity Constant Covariance Boolerslev-Wooldridge method so that the assumption of error spreads was maintained morally (Asmara 2011).

TABLE IV. NORMALITY TEST

Variable	*Jarque-bera*	Prob*	Note
Producer Price (HPBP)	25.65014	0.000003	not normally distributed
Import Retail Price (HIBP)	6.267865	0.043546	not normally distributed
World Prices (HDBP)	30.62049	0.000000	not normally distributed

Note: *stationary level at 5%

Based on Table V, it can be seen the results of the evaluation of the ARCH/GARCH model with the ARCH effect test with the *Lagrange Multiplier* (LM) value. The ARCH LM-Test results, the price of garlic at producer level, imported garlic retailer, and world prices (the Chinese market) have been freed from the effects of ARCH or the effects of heteroscedasticity. So the model that has been obtained can be said to good (Asmara 2011).

TABLE V. ARCH EFFECT TEST

Variable	F-statistic	Prob*	Note
Producer Price (HPBP)	0.023947	0.8774	no ARCH effect
Import Retail Price (HIBP)	0.479321	0.4851	no ARCH effect
World Prices (HDBP)	0.134044	0.7114	no ARCH effect

Note: *stationary level at 5%

The best ARCH/GARCH model for volatility of garlic price estimation in producer-level based on results analysis that obtained by the ARCH model (1, 0). Based on this model, volatility pattern of garlic prices in producer-level on January 2012 to September 2019. The equation of garlic price in producer-level equations obtained was $\sigma^2_t = 0.0199 + 0.5537\ \varepsilon^2_{t-1}$. The model provides information that the variance of disturbance variable (σ^2_t) in the ARIMA model was influenced by interference variable square in previous period (ε^2_{t-1}). The coefficient value of disturbance squared variable was 0.5537 which indicate the volatility of garlic prices at producer level was quite responsive to market dynamics. This means that price volatility that occurred in one previous period has a fairly strong impact on price volatility in next period.

The best ARCH/GARCH model for estimating price volatility of imported garlic retailers obtained the ARCH model (1, 0) with equation was $\sigma^2_t = 0.0056 + 0.6059\ \varepsilon^2_{t-1}$. The estimation results show that the coefficient value of the variable squared disturbance was 0.6059 which indicates price volatility at level of imported garlic retailers was quite responsive to market dynamics. This means that price volatility was occurred in one previous period has a fairly strong impact on price volatility in the next period.

Whereas for the best estimation of ARCH/GARCH model from the world price variable (Chinese market), the GARCH equation (1, 1) was obtained with the following equation $\sigma^2_t = 0.0002 + 0.2751\, \varepsilon^2_{t-1} + 0.8050\sigma^2_{t-1}$. Estimation results show that the number of disturbance coefficient values in the previous period (ε^2_{t-1}) and the error variance coefficient value in the previous period (σ^2_{t-1}) were close to one. This indicates the volatility of garlic prices at the world level is very responsive to market dynamics. This means that price volatility in the previous period and conditional variance in the previous period have a very strong impact on price volatility in the next period.

Based on the estimation results of the ARCH/GARCH model, it was showed that the fluctuation of garlic price in producer level, imported garlic retailers, and world market. The price volatility of garlic at the producer level can be seen in Fig. 3. Based on the figure, it was known that there was significant increase in the volatility of the garlic price at producer level. The price increase starts from January 2017 to May 2017. Price volatility continues to increase until it exceeds two standard deviations in that period. This happens due to an imbalance between demand and supply of garlic at producer level.

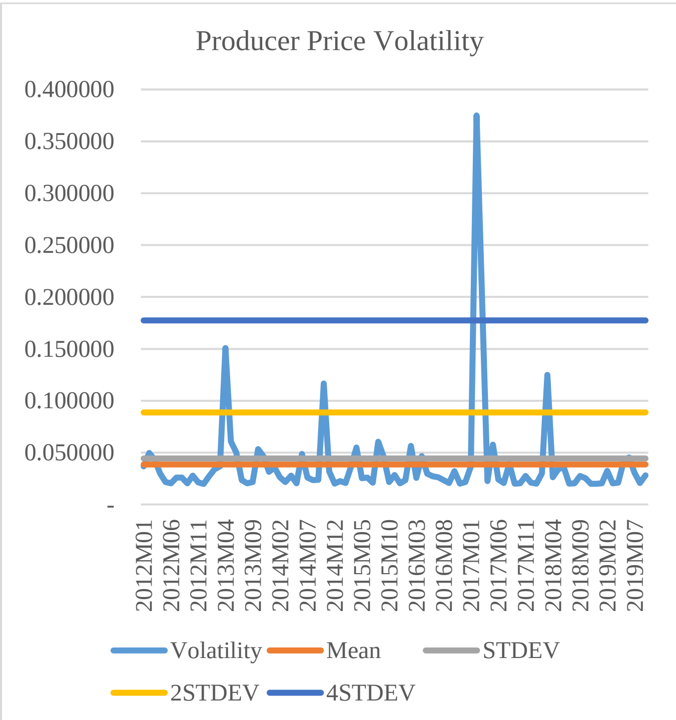


Figure 3. Producer Price Volatility

The price volatility of garlic at imported garlic retailers level can be seen in Fig. 4. Based on the Fig. 4, it showed that there was a significant increase in volatility of garlic prices at imported garlic retailers level. The price increase began from January 2013 to June 2013. Price volatility continued to increase until it passed two standard deviations in that period. This value was a high enough value with a fairly short period. Price volatility has increased again in February 2019 until July 2019 and does not exceed two standard deviations. These results indicate a gap between demand and supply of garlic commodities at imported garlic retailers level.

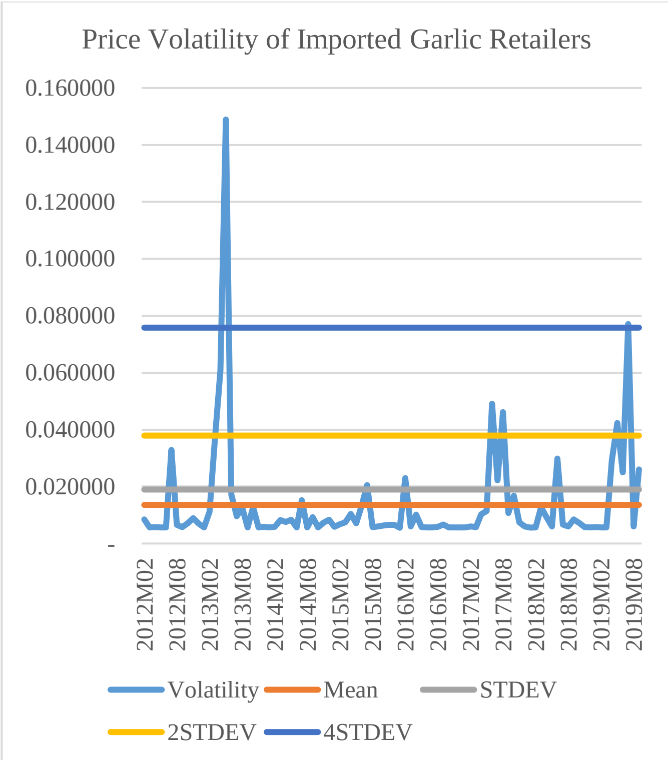


Figure 4. Price Volatility of Imported Garlic Retailers

The results of price volatility analysis on world market (Chinese market) can be seen in Fig. 5. Based on Fig. 5, it showed that there is an increase in the volatility of garlic prices on the world market gradually. The price increase starts from d June 2016 to February 2019. This value was a high enough value. Price volatility has increased again in March 2019 until September 2019. These results indicate a gap between demand and supply.

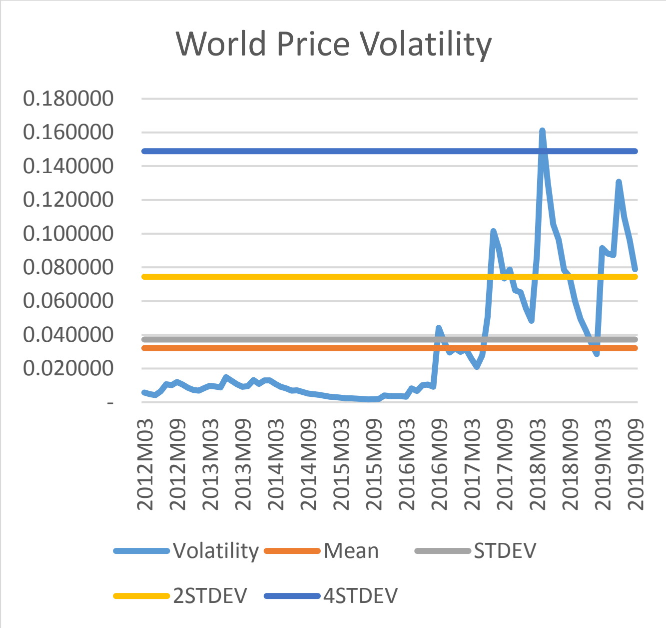


Figure 5. World Price Volatility

IV.CONCLUSION

In general, the world price of garlic has a higher volatility compared to price of garlic at retail and producer levels. The movement of global garlic prices was influenced by many factors, so that the world price of garlic was more responsive in market dynamics. Meanwhile, garlic price at retail level of imported garlic was more volatile compared to garlic price at producer level. This also shows that the garlic price at retail level of imported garlic was more responsive in market dynamics.

The tendency of garlic price movements in long run was the uptrend (upward price trend). So that, the government could utilize this as a momentum to increase garlic production and reduce imports by implementing policies that aimed at improving domestic garlic market through improving the economic efficiency of garlic, both in terms of cultivation, post-harvest, processing and marketing of the results, conducting an inventory of potential in several potential garlic production centers to re-develop local garlic, and improving the marketing systems through institutional or institutional farmers and government institutions. In addition, the government can also learn the methods that carried out by Chinese government. So that, China would be able to became the largest exporter of garlic in the world and adopt those methods that adapted to the Indonesia's conditions.

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