SUPPLY ANALYSIS OF RICE, RED CHILI AND SHALLOT IN INDONESIA

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ABSTRAK

Pasokan dan harga adalah dua variabel yang berkorelasi satu sama lain termasuk untuk komoditas utama seperti beras, cabai dan bawang merah. Beras, cabai dan bawang merah merupakan salah satu makanan pokok dari banyak bahan yang dibutuhkan oleh masyarakat untuk memenuhi kebutuhan pangan. Tingginya konsumsi komoditas ini membuat harga beras, cabai dan perubahan bawang merah secara dramatis. Hal ini terkait dengan waktu panen yang menyebabkan over supply, hari raya yang sering meningkatkan konsumsi masyarakat, dan juga semua masalah yang terkait dengan karakter produk pertanian seperti tahan lama, tergantung pada alam codition etc.The Tujuan dari penelitian ini adalah untuk menggambarkan umum kondisi pasokan tiga komoditas utama di Indonesia, beras, cabai merah dan bawang merah dan menganalisis pasokan beras, Red Chili dan bawang merah di Indonesia sehubungan dengan harga masing-masing komoditas. Data yang digunakan adalah data bulanan yang diambil dari 19 provinsi di Indonesia. Data yang diperoleh diperlakukan dengan regresi dinamis. Hasilnya akan menunjukkan apakah ada hubungan antara pasokan dan harga dan apakah ada perbedaan harga komoditas antar pada bulan tertentu dan bagaimana interaksi antara penawaran dan jenis komoditas pengaruh harga.

Kata kunci: pasokan, harga, makanan pokok

ABSTRACT

Supply and price are two variables which are correlated each other including to main commodities like rice, chili and shallot. Rice, chili and shallot is one of the staple foods of many ingredients needed by the community to meet the need for food. The high consumption of these commodities make price of rice, chili and shallot change dramatically. This is related to harvest time which cause over supply , feast day which often increase people consumption, and also all the problems which are related to character of agriculture products like perishable, depending on nature codition etc.The aim of this research is to describe general supply condition of three main commodities in Indonesia, rice, red chili and shallot and to analyze supply of Rice, Red Chili and Shallot in Indonesia regarding to the price of each commodity. The data used are monthly data which were taken from 19 provinces in Indonesia. The data obtained were treated by dynamic regression. The results will show whether there is correlation between supply and price and whether there is price differences of inter commodity in certain month and how interaction between supply and type of commodity influence the price.

Key words : supply, price, staple foods

1. INTRODUCTION

Rice, Chili and shallot is some of the staple foods of many ingredients needed by the community to meet the need for food. The high consumption of rice, chili and shallot make the price rose dramatically. Rice, chili and shallot also have an important role in economy because the price of rice, chili and shallot gives great contribution to inflation.

Rice is one of the three leading food crops in the world. Rice provides mineralss, vitamins, and fiber. Rice is also the most important crop to small farmers and to the many landless workers who derive income from working on the others land. Millions of Indonesian people are involved in rice production, rice processing and other post-harvest activities related to rice.

Rice consumption in Indonesia is among the highest in the world. Domestic total consumption during 2008-2012 is shown in Table 1. Total consumption is (1) Household consumption, (2) Processing Industry, (3) Rice Missing.

Table 1. Consumption and Surplus/Defisit of rice, 2008-2012

Year	Consumption (000 ton)	Production (000 ton)	Surplus/defisit	
			Ribu ton	%
2008	31.799	33.915	2.116.3	6.24
2009	32.195	36.205	4.009.9	11.08
2010	33.068	37.369	4.301.3	11.51
2011	33.056	36.968	3.912.	10.5

|			1	8
2012	33.047	38.823	5.776.2	14.88
Laju (%/tahun)	0.97	3.48	-	-

Source :

Red chili is horticulture commodity which is very interesting. Chili is commodity with high price. Money which is invested can return to investor quickly. Consumer side consider that chili is horticulture commodity which is source of nutritient like vitamin A, B, C and beta karoten. Therefore Red Chili has high economic potential which is called red gold.

As horticulture product, Red chili depends on nature condition and has perishable characteristic. Therefore red chili supply is really fluctuated. This condition cause the price is not steady whole time. The fluctuating of red chili price is shown by picture 1.

Shallot (Allium ascalonicum L.) is one of the important horticultural commodities in Indonesia. There is a high demand for shallot in Indonesia, with as much as 14% of the demand being met by imports.
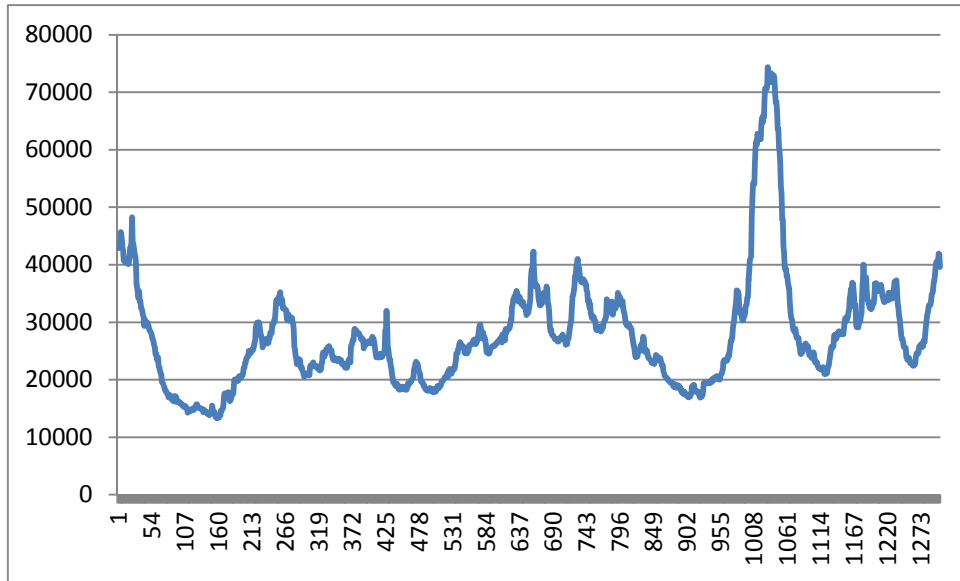
Picture 1. Fluctuating of Red Chili Price

Source : Trade Ministry (2016)
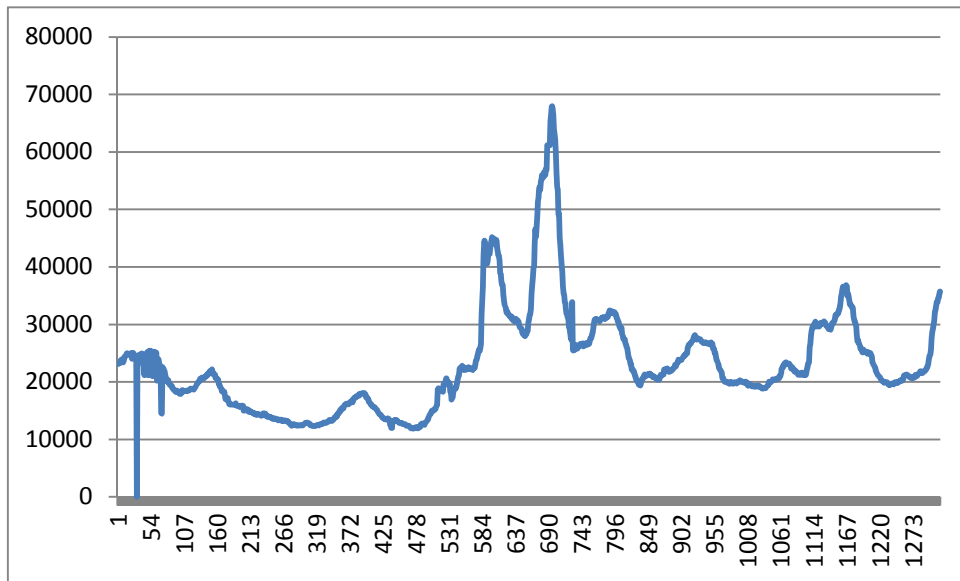
Picture 1. Fluctuating of Shallot Price

Source: Trade Ministry (2016)

Supply analysis is a detailed review of the inputs and outputs of a process that is employed to assess how the available quantity of a product is affected by changes in demand, input factors and production techniques. Supply analysis is often used to make key policy decisions by manufacturing business managers since it gives them insight into how shifts in production are likely to influence market supply.

II. METHODS

2.1. Data Collection And Analysis

The data used are secondary data which were obtained from agricultural

ministry. There are supply and price of three kinds of staple foods including (rice, chili and shallot) collected from 19 provinces. 19 provinces are consist of Bengkulu, West Nusa Tenggara, Aceh, Yogyakarta, Central Sulawesi, Lampung, Bali, North Sulawesi, West Sumatera, Riau, North Sumatera, Central Java, West Java, Jambi, East Java, South Kalimantan, West Kalimantan, South Sulawesi, and South Sumatera.

The research design of this study was quantitative and used regression analysis to measure the relationship of the predictive variables to the dependent variable. Data regarding the dependent variable and predictive variables were compiled ad entered into the Statistical package for Social Sciences (SPSS) software program.

Regression is a generic term for all methods attempting to fit a model to observed data in order to quantify the relationship between two groups of variables. The fitted model may then be used either to merely describe the relationship between the two groups of variables, or to predict new values.

There are multiple benefits of using regression analysis. They are as follows:

1. It indicates the significant relationships between dependent variable and independent variable.

2. It indicates the strength of impact of multiple independent variables on a dependent variable.

Regression analysis also allows us to compare the effects of variables measured on different scales, such as the effect of price changes and the number of promotional activities. These benefits help market researchers / data analysts / data scientists to eliminate and evaluate the best set of variables to be used for building predictive models

The two data matrices involved in regression are usually denoted X and Y, and the purpose of regression is to build a model $Y = f(X)$. Such a model tries to explain, or predict, the variations in the Y-variable(s) from the variations in the X-variable(s). The link between X and Y is achieved through a common set of samples for which both X- and Y-values have been collected.

A one dimensional surface in a two dimensional or two-variable space is a line defined by the equation $Y = b_0 + b_1X$. According to this equation, the Y variable can be expressed in terms of or as a function of a constant (b_0) and a slope (b_1) times the X variable. The constant is also referred to as the intercept, and the slope as the regression coefficient. In the multiple regression case, when there are multiple predictor variables, the regression surface usually cannot be visualized in a two

dimensional space, but the computations are a straightforward extension of the computations in the single predictor case.

Vogelvang (2005) described the specification of the linear model is:

$$Yt = \beta 1 + \beta 2 Xt2 + \cdots + \beta k Xtk + ut$$
$$ut \sim NID\ (0, \sigma_u^2)$$

NID means normally, independently distributed. All the assumptions concerning this model will be explained below.

First, the assumptions concerning the specification of the equation, the deterministic assumptions, are introduced,

- Yt is the endogenous, dependent variable.

- Yt is explained by K linearly independent exogenous explanatory variables X_{tk}, with k = 1, ..., K.

- The first explanatory variable is: X_{t1} = 1 for all t. This is the constant term. In general it will be assumed that a constant term is included in the model.

- The number of observation in the sample period is equal to n : t = 1, . . ., n; for an accurate estimation estimation result it is desirable that n is clearly larger than K

- The difference between the number of observations and the number of explanatory variables n – K, is the number of degrees of freedom of the

model. The estimation results generally improve as n – K increases.

- The structure is constant in the sample period, or in other words all the parameters βk are constant in the sample period. In general, this has consequences for the choice of n. The length of the sample period must be chosen such that economic structure has not changed in that period.

- The K explanatory variables XtK are linearly independent and form the systematic part of the model.

Next consider the *stochastic assumptions*.

- The variable ut is the disturbance term, which is the non-systemicnpart of the model. The disturbance term is not observed. Assumption about ut are made and will be tested after the parameters have been estimated. Often these test will be interpreted as model specification test

- The variable ut is assumed to be normally, independently distributed. This assumption means that all the n disturbances have been drawn from independent, identical normal distributions. The normality assumption is not necessary to estimate the parameters with the ordinary least square estimator but it is required when assumptions or hypotheses are to be tested. The moments of the disturbance

term in model (4.1) have to be constant, as ut may have no systematic influence. The mean, variance and autocovariance of u_t are (with E as the expectations operator):

$$E(u_t) = 0; t = 1, \ldots, n$$

The variance σ_u^2 is constant, or in other words the disturbance term is homoskedastic or no heteroskedastic. The autocovariances are zero, which means that no autocorrelation is present; of course, this is relevant for time series models only. Then we also know the expectation of the endogenous variable Yt, conditional on the explanatory variables

$$Yt = \beta 1 + \beta 2 Xt2 + \cdots + \beta k Xtk + ut$$
$$E(Yt) = \beta 1 + \beta 2 Xt2 + \cdots + \beta k Xtk + E(ut)$$
$$E(Yt) = \beta 1 + \beta 2 Xt2 + \cdots + \beta k Xtk$$

2.2. Regression with Dummy Variables

With interval and ordinal variables we can use nominal level variables that are dichotomous, such as gender, in multiple regression analysis. we have used a dichotomous variable for age to define subsets of cases. We can also use dichotomous variables as independent variables in regression. When scored as either a 0 or 1, dichotomies are often referred to as "dummy" variables. They indicate either the absence or presence of a characteristic or trait. Hence they function as a "dummy" for the variable in question.

The most obvious use is when a variable either already has or has been recoded into two categories. However, the logic of dummy variables can also be extended to enable us to include nominal level variables with more than two categories in our multiple regressions. Examples of such variables include region, province, country, Canadian party identification, occupation and marital status.

At least one category must always be omitted which leaves something with the value of zero with which to compare each of the other categories. This would create a situation of multi-collinearity. So we intentionally leave out at least one of the categories. The omitted category becomes the reference category against which the effects of the other categories are assessed. We can interpret the results as the difference between each category and this omitted category.

The data are consist of one variable dependent and three variables independent, Y as price, X1 as supply, X2, X3 and X4 are type of commodity which are rice, red chili and shallot. X4 (shallot) becomes the reference category against which the effects of the other categories are assessed.

III. RESULTS

3.1. Supply Analysis model in June

Estimation of fuctional relationship between price as dependent variables and predicted factors as independent variables (supply, rice, red chili and shallot) use multiple regression. Based on data, the regression model of supply analysis in June is

$$Y = 10997.471 - 0.070X_1 - 10582.727X_2 - 10887.609X_3$$

Accuracy of regression model is tested by using F test. Based on the output, F value is 2.587, significant at 10 percent significance level. It means that model can be used to explain influence of independent variables simultaneously towards the price.

Futhermore it is important to know determination coefficient (R^2) of model. The determination coefficient (R^2) is used to know the influence of independent variables towards dependent variable. The R square value is 0.252. It means that the total variation in dependent variable, Price can be explained 25.2% by independent variables, supply, rice and chili meanwhile the rest is explained by variables which are not included the model

Partial test with t-test show that commodity and supply cannot significantly predict the price. ($F = 2.578$, $p = 0.078$). It can be seen that there is the distinct between rice and shallot ($F = -2.152$, $p = 0.042$) and there is the difference between chili and shallot (($F = -$

2.335, $p = 0.029$) . Based on model, supply has negative coefficient which means that the higher supply, the lower price. P value of supply is 0.829 which means the inluence of supply towards the price is not significant.

3.2. Supply analysis model in July

Estimation of fuctional relationship between price as dependent variables and predicted factors as independent variables (supply, rice, red chili and shallot) use multiple regression. Based on data, the regression model of supply analysis in July is

$$Y = 23748.327 + 0.034X_1 - 14997.367X_2 + 5197.044X_3$$

Accuracy of regression model is tested by using F test. Based on the output, F value is 30,431, significant at 1 percent significance level. It means that model can be used to explain influence of independent variables simultaneously towards the price.

Futhermore it is important to know determination coefficient (R^2) of model. The determination coefficient (R^2) is used to know the influence of independent variables towards dependent variable. The R square value is 0.772. It means that the total variation in dependent variable, Price can be explained 77.2% by independent variables, supply, rice and chili meanwhile

the rest is explained by variables which are not included the model.

Partial test with t-test show that commodity and supply cannot significantly predict the price (F = 30.431, p = 0.000). It can be seen that there is the distinct between rice and shallot (F = -6.706, p = 0.000) and there is the difference between chili and shallot (F = 2.245, p = 0.033) . Based on model, supply has positive coefficient which means that the higher supply, the higher price. P value of supply is 0.509 which means the inluence of supply towards the price is not significant. Here, p = 0.000, which is less than 0.05, and indicates that, overall, the regression model statistically significantly predicts the outcome variable (i.e., it is a good fit for the data).

3.3. Supply anaysis model in August

Estimation of fuctional relationship between price as dependent variables and predicted factors as independent variables (supply, rice, red chili and shallot) use multiple regression. Based on data, the regression model of supply analysis in August is

$$Y = 18919.043 + 0.012X1 - 9517.771X2 + 13718.367X3$$

Accuracy of regression model is tested by using F test. Based on the output, F value is 44.687, significant at 1 percent significance level. It means that model can

be used to explain influence of independent variables simultaneously towards the price.

Futhermore it is important to know determination coefficient (R2) of model. The determination coefficient (R2) is used to know the influence of independent variables towards dependent variable. The R square value is 0.784. It means that the total variation in dependent variable, Price can be explained 78.4% by independent variables, supply, rice and chili meanwhile the rest is explained by variables which are not included the model.

Partial test with t-test show that commodity and supply cannot significantly predict the price (F = 44.687, p = 0.000). It can be seen that there is the distinct between rice and shallot (F = -4.864, p = 0.000) and there is the difference between chili and shallot (F = 6.581, p = 0.000) . Based on model, supply has positive coefficient which means that the higher supply, the higher price. P value of supply is 0.272 which means the inluence of supply towards the price is not significant. Here, p = 0.000, which is less than 0.05, and indicates that, overall, the regression model statistically significantly predicts the outcome variable (i.e., it is a good fit for the data).

3.4. Supply analysis model in September

Estimation of fuctional relationship between price as dependent variables and predicted factors as independent variables (supply, rice, red chili and shallot) use multiple regression. Based on data, the regression model of supply analysis in September is

$$Y = 17995.217 + 0.040X1 - 8293.268X2 + 10675.382X3$$

Accuracy of regression model is tested by using F test. Based on the output, F value is 38.451, significant at 1 percent significance level. It means that model can be used to explain influence of independent variables simultaneously towards the price.

Futhermore it is important to know determination coefficient (R^2) of model. The determination coefficient (R^2) is used to know the influence of independent variables towards dependent variable. The R square value is 0.752. It means that the total variation in dependent variable, Price can be explained 75.2% by independent variables, supply, rice and chili meanwhile the rest is explained by variables which are not included the model.

Partial test with t-test show that commodity and supply cannot significantly predict the price (F = 38.451, p = 0.000). It can be seen that there is the distinct between rice and shallot(F = -4.780, p = 0.000) and there is the difference between chili and shallot((F = 5.966, $p = 0.000$). Based on model, supply has positive coefficient which means that the higher supply, the higher price. P value of supply is 0.272 which means the inluence of supply towards the price is not significant. Here, $p = 0.000$, which is less than 0.05, and indicates that, overall, the regression model statistically significantly predicts the outcome variable (i.e., it is a good fit for the data).

3.5. Supply analysis model in October

Estimation of fuctional relationship between price as dependent variables and predicted factors as independent variables (supply, rice, red chili and shallot) use multiple regression. Based on data, the regression model of supply analysis in October is

$$Y = 19147.454 - 0.006X1 - 9224.924X2 - 352.956X3$$

Accuracy of regression model is tested by using F test. Based on the output, F value is 38.451, significant at 1 percent significance level. It means that model can be used to explain influence of independent variables simultaneously towards the price.

Futhermore it is important to know determination coefficient (R^2) of model. The determination coefficient (R^2) is used to know the influence of independent variables towards dependent variable. The

R square value is 0.459. It means that the total variation in dependent variable, Price can be explained 45.9% by independent variables, supply, rice and chili meanwhile the rest is explained by variables which are not included the model.

Partial test with t-test show that commodity and supply cannot significantly predict the price (F = 9.887, p = 0.000). It can be seen that there is the distinct between rice and shallot (F = -4.671, p = 0.000) and there is the difference between chili and shallot (F = -0.176, p = 0.861).

Five models shows that supply always influence the price. The relationship between supply and price could be positive or negative. It depends on the real condition. The positive correlation represent that the price move for the first time following with price. Price is variable which influence supply. When price increase, supply will increase following the price. It follows the supply and demand theory. The next models shows the another condition. Price and supply has negative correlation. It can be concluded that supply is the variable moving for the first time. The abundant of market commodity supply result the price decrease and the low of market commodity supply results the price increas.

Two models, June and October have determination coefficient which are smaller than fifty percent. It means that more that fifty percent of model is explained by the other variables.

IV. CONCLUSION

The determination coefficient (R2) is used to know the influence of independent variables towards dependent variable. Almost all of the models have good determination coefficient which is more than 50 percent. It means that the total variation in dependent variable can be explained by independent variables, supply, rice and chili meanwhile the rest is explained by variables which are not included the model.

Commodity and supply cannot significantly predict the price It can be seen that there is the distinct between rice and shallot and there is the difference between chili and shallot in all of months which are tested.

Five models shows that supply always influence the price. The relationship between supply and price could be positive or negative. When price increase, supply will increase following the price. It follows the supply and demand theory. The next models shows the another condition. Price and supply has negative correlation.

Some of models have coefficient determination which is less than 50 percent. It is needed some other variables to explain the real condition. Thus, It is

expected that model will explain the real condition better and coefficient determination will close to 100 percent. It is better to make time period of analysis longer than before. Thus, real condition can be well captured by model.

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