Analyses of Food Price Stabilization in Indonesia

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Abstract. *This study is aimed to investigate the factors that can affect rice, small red chilies and shallots prices by using the Vector Error Correction Model and estimating the psychological prices existing at Rice Wholesale market Cipinang and Kramat Jati Wholesale market through the use of Willingness to Pay approach. The results of the research show that the amount of supply and stock can decrease the commodity fluctuating prices; besides, fulfillment of small red chilies and shallots very much depends on import. The government should refer to WTP value of consumers as a consideration concerning the import reference price. Developing a wholesale market and auction market link can also be carried out as one of the methods to stabilize prices.*

Keywords: *price stabilization, Vector Error Correction Model, Willingness to Pay.*

JEL code: *O24, Q18*

Introduction

Food price stabilization is a crucial problem for every country, including Indonesia. Population increase, climate change, and international trade flow will affect food security and Indonesian people's welfare. The previous research by Resnia (2012) showed that the price of food stuff tended to increase as much as 5 – 12% per year during the 1999-2011 periods. These food commodities were, among others, rice, chilies, and shallots.

Rice is a strategic commodity that can influence economical, social as well as political stability. Rice commodity is still one of the key commodities that can influence the stability of general prices. The increased price of rice can trigger that of other goods (Sari, 2010). The price of medium rice has an increasing trend. This increased price, if no action is taken, can increase inflation and decrease the people's purchasing power.

Chilies and shallots are Indonesian horticultural product that Indonesian people very much needed. The consumption of chilies in Indonesia for the last five years (2008-2012) has showed that the types of chilies that are mostly consumed by households are big red chilies, small red chilies, and the smallest is green chilies. However, if it is seen from the price stability point of view, the small red chilies have the lowest price stability, whose coefficients vary as much as 43.01%,

compared to big red chilies, with a coefficient of 22.04%, curly chilies as much as 26.28% and green chilies as much as 27.28% (Bappenas, 2013).

To muffle the increased price fluctuation the government has issued an import policy. This policy should be of short-term in nature and should be temporary because imported goods from other countries are usually distorted by subsidy that is given by the original government where the product comes from (Sawit, 2003). The import policy is also influenced by the price of commodities in the international markets and the exchange value that is valid in a certain period (Cinthia, 2013).

However, the import policy for red chilies and shallots was carried out every year and the amount kept increasing from 2006 to 2012, so that the government had to take action to limit access for horticultural products based on the Regulation of The Ministry of Agriculture No. 60/2012 concerning recommendation for importing horticultural products and the Regulation of the Ministry of Trade No. 30/2012 concerning regulations for importing horticultural products. These regulations limit the access for those commodities to four gates, namely Soekarno-Hatta Airport, Tanjung Perak, Belawan, and Makassar.

This policy has been sued by the United States of America to World Trade Organization (WTO), since it is considered to inflict the US export. This US sue has eventually made the Ministry of Trade revise its horticultural import regulation through its new regulation No. 16/2013 concerning regulation for importing horticultural products whose main points are to disannul regulations about access gates for imported products and to use reference price or parity for importing horticulture. The import reference prices for small red chilies are Rp 28,000/Kg and shallots are Rp 25,700/Kg, which means that the government had the right to open import if the retail prices of the commodities over the reference price.

This import reference pricing policy led to criticism from several parties including shallots and chilies farmers who considered that the magnitude of the reference price is not representative for production centers district. The government should encourage and discuss with them in order to determine the import reference price. In addition, questions also arise about the basis of the calculations that produced these figures and also which location and time of retail price will be used to decide import.

From the point of view of in-country trade, the market function as an important institution in the commodity distribution system in the market needs to be considered carefully. Ability in controlling the factors that influence the distribution channel allegedly can reduce inflation from the volatile food (Prastowo, Yanuarti and Depari 2008).

One of the domains that need to be considered in the agricultural commodity flow is the main market or distribution centre of the commodity. Distribution centre or main market is a place that functions as the support of the main commodity to support the smooth flow of the goods, inter districts or cities and inter provinces for domestic markets as well as global ones.

Distribution of rice, chilies and shallots involves two wholesale markets, namely Pasar Induk Beras Cipinang (PIBC) and Pasar Induk Kramat Jati (PIKJ). Both markets have a great amount of supply, and the transaction volume is so big that they function to distribute rice, chilies and shallots not only to Jakarta but also to other areas and islands in Indonesia. One of the functions of a market is to determine the value or price, and so are Pasar Kramat Jati and Pasar Cipinang.

The level of price that occurs in the market will be influenced by the expense that must be spent by the seller, competition in the market and the consumer's willingness to pay (WTP) value. According to Le Gall Ely (2009), the consumer's WTP value is a maximum price that is ready to be paid by the consumer because of constrained fund or the minimum price that is ready to be paid because of doubts about the commodity quality if the price is lower than the minimum one. This WTP value expresses the psychological price level that occurs in the market at a certain time and it can be estimated by using survey to consumers.

The price that tends to increase each year will influence the consumers' purchasing power, especially that of low income people. They will have difficulty to reach the commodities' price level. In turn, it will make people unable to meet other necessities such as health and education (Ahsan et.al, 2012). Based on the background and formulation of the problem described above, the objectives of the research are to analyze factors that can influence price fluctuation, to estimate the psychological price of rice, small red chilies, and shallots, and to recommend the food price stabilization policy.

Research Methodology

There are two types of data that are used in this research, namely primary and secondary data. Primary data are used to estimate the consumer's WTP value at PIKJ and PIBC. The research was carried in April – May 2014. Questionnaire distribution is carried out using *judgmental sampling* method, where respondents are chosen based on the market management consideration since he knows well the market situation. The number of respondents taken is sixty persons consisting of twenty persons for each commodity.

Secondary data is used to analyze relation between the price of chilies and that of shallots in Kramat Jati Market and the amount of supply, exchange value, import value and international price using time series data from January 2006 to December 2013. On the other hand, the rice commodity uses time series data from January 2007 to December 2013 and stock amount variables. The secondary data come from the PIKJ and PIBC management, the Ministry of Trade, Statistics Center Agency, Bank of Indonesia, International Monetary Fund (IMF), *National* Commodity and Derivatives Exchange Limited (NCDEX) and National Horticultural Research and Development Foundation (NHRDF).

To analyze factors that can influence the price of rice, chilies, and shallots, the *Vector Error Correction Model (VECM)* analysis, which is a *Vector Auto Regressive* (*VAR*) model, is used. This analyzing method is a restricted Vector Auto regressive (VAR) that is used for non-stationary but potentially-cointegrative variables. Therefore, *VECM* is often called as a *VAR* design for non-stationary series of cointegrative relation. The equation of VECM (Firdaus, 2012) can be illustrated as follows:

$$\Delta y_t = \mu_{0x} + \mu_{1x}t + \Pi_x y_{t-1} + \sum_{i=1}^{k-1} \Gamma_{ik} \Delta y_{t-1} + \varepsilon_t \qquad (1)$$

Where y_t is a vector that contains variables analyzed in the research; μ_{0x} is an intercept vector; μ_{1x} is a regression coefficient vector; t is time trend; Π_x is $\alpha_x\beta'$ where b' contains a long-term co-integration equation; y_{t-1} is a level variable; Γ_{ik} a regression coefficient marix; k-1 is a VECM ordo from VAR; and ε_t is an error term.

The above equation model will be used for each commodity of rice, small red chilies and shallots. The variables analyzed are the price of rice at Cipinang

(PRC), the price of small red chilies at Kramat Jati (CKJ), the price of shallots at Kramat Jati (SKJ), amount of supply (AS), international price (IP), exchange rate (ER), import volume (IV), and for rice the amount of stock (ST).

To estimate the psychological price, the Consumer's WTP value is used. To calculate the average value of WTP, data from questionnaires will be used using the following formulation (Fauzi, 2010) :

$$\text{EWTP} = \sum_{i=1}^{n} Wi.Pfi \qquad (2)$$

Where EWTP is an average value allegation of WTP (Rp); Wi is WTP i value (Rp); Pfi is a relative frequency; i is repondet i; and n is the number of respondents. To know the demography factor that influences the consumer's WTP value, double regression analyses are carried out using independent variables of Age (AG), education level (EL), amount of income (IC), and number of family members (FM).

Results of *VECM* Estimation

Results of *VECM* estimation for rice commodity (Table 1) show that in the short term the significant variables involved are the price of rice at Cipinang and its stock supply. Besides, a significant alleged error correction parameter shows the mechanism of adjustment from short-term to long-term. The amount of adjustment from short-term to long-term is 0.15 percent. For the long-term, the variables of amount of supply and amount of stock have a negative impact on the price of rice at Cipinang. The increase of exchange rate also has a negative impact on the price of rice at Cipinang. This is because the government through Logistic Bureau (Bulog) maintains the stabilized price of rice through import monopoly (Ackerman et.al, 1999; Gaulier *et.al*, 2006).

Table 1 VECM Estimated Results of Rice

Variable	Coefficient	t-statistic
CointEq1	**-0.15***	-3.00
Short-term		
D(PRC (-1))	**0.26***	2.24
D(AS(-1))	0.002	1.02
D(IP(-1))	0.47	0.99
D(ER(-1))	0.08	1.35
D(IV(-1))	-2.23E-07	-0.79
D(ST(-1))	**0.010***	1.99
Long-term		
AS(-1)	**0.04***	4.43
IP (-1)	-0.56	-0.78
ER (-1)	**0.22***	2.53
IV (-1)	-5.85E-07	-0.48
ST (-1)	**0.03***	3.41

***** significant at the 0.05 level

The estimated *VECM* result for small red chilies (Table 2) can be seen that in the short-term one significant variable is international price. In addition to that, there is a significant alleged error correction parameter which shows an adjustment mechanism from short-term to long-term as much as 0.16 percent. The

long-term estimation shows that the variables of the amount of supply and import volume have a negative impact on the price of red chilies at Kramat Jati Market.

The estimated *VECM* result for shallots (Table 2) shows that there is a significant alleged error correction parameter that shows an adjustment mechanism from short-term to long-term as much as 0.36%. Import volume also has a significant value; nevertheless, its coefficient value is only 0.0001. Thus it can be said that short-term will not affect the price of shallots. The results of long-term estimation show that the international price variable gives a positive impact, whereas the amount of supply gives a negative impact, on the price of shallots. The long-term import volume variable will increase the price of shallots. This is possible because of a slow increase in production, while demands from households and industries keep increasing so sharply that additional import in the long-term is unable to stabilize the price of shallots.

Table 2 VECM Estimated Results of Small Red Chilies and Shallots

Variable	Small Red Chilies		Shallots	
	Coefficient	**t-statistic**	**Coefficient**	**t-statistic**
CointEq1	**-0.10***	-5.07	**- 0.36***	-4.19
Short-term				
D(CKJ(-1))	0.04	0.45	-	-
D(SKJ(-1))	-	-	0.14	1.34
D(IP(-1))	**5.69***	3.15	1.58	0.28
D(AS(-1))	0.36	0.30	1.08	1.11
D(ER(-1))	0.38	0.15	1.82	1.53
D(IV(-1))	0.00	0.26	**-0.0001***	-2.54
Long-term				
IP(-1)	-2.52	-0.44	**-16.73***	-3.85
AS(-1)	**28.23***	3.09	**8.78***	6.90
ER(-1)	5.65	0.65	-1.66	-1.85
IV(-1)	**0.12***	5.09	**-0.0003***	-4.23

*significant at the 0.05 level

Impulse Response Function (IRF) Analyses

Analysis of IRF is conducted to analyze responses of each commodity prices to one standard deviation shocks themselves, amount of supply, stock, exchange rate, import volume and international price for the next 24-month period. Appendix 1 shows the results of IRF estimation for each commodity. Shocks on the variable of amount of supply will be responded negatively by all commodity prices. However, shocks on the price itself and international price will be responded positively by the price. Shock on the amount of rice stock initially is responded positively by the price, but in the fifth month it will be responded negatively by the price. This shows that additional amount of stock in the long-term will be able to muffle the price of rice.

Shock at the exchange rate on rice was initially responded positively by the price; however, by the fourth month it is responded negatively by the price. This indicates that medium rice import monopoly carried out by Logistic Bureau has caused the exchange rate value has a fluctuating impact on rice. On red chilies the shock at the import value will be responded negatively; meanwhile, on the shallots

until the third month the shock is still responded negatively. However, after that it will be responded positively.

Forecast Error Variance Decomposition (FEVD) Analyses

Contribution of shocks to variables in explaining commodity prices can be seen from the results of the FEVD analysis. The results of *FEVD* analyses on rice show that the price of rice at Cipinang is very much influenced by its own price and the amount of supply. For red chilies, the price is influenced by its price, import volume, and amount of supply. On the other hand, the price of shallots is influenced by its price, amount of supply and international price. To make it clear, the results of FEVD estimation can be seen on Appendix 2.

'Willingness To Pay' Estimation

Estimation of *WTP* respondent averaged value for medium rice is Rp. 8,360/kg, red chilies Rp 47,000/kg and shallots Rp 14,600/kg. Information concerning the WTP value is important for producers (farmers), merchants, and the government. The analyzing results of the factors that influence the WTP value of rice, chilies and shallots can be seen in Table 3.

Table 3 Factors that influence WTP

Variable	Rice		Red chilies		Shallots	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
1. Age (AG)	44.22	0.60	953.78	0.77	-188.3	0.64
2. Education level (EL)	304.10	**0.08****	273.77	0.87	449.03	**0.09****
3. Amount of income (AI)	376.57	**0.02***	5625.9	**0.07****	624.85	**0.09****
4. Number of Family Members (NFM)	24.58	0.58	3147.7	0.17	-6.20	0.97

Note: * significant at the 0.05 level
** significant at the 0.10 level

From Table 3 above it can be seen that the significant variable that influence WTP of rice, red chilies and shallots is amount of income. On the other hand, education level only has a significant influence on rice and red chilly commodities. The amount of income only influences significantly on rice and shallots commodities. Amount of income and education level have both positive impacts. This means that the increase in income and education level will cause the increase of consumers' WTP value.

Discussion

Demands for rice, chilies and shallots will always increase every year, in line with the economic and population growth in Indonesia. Indonesian people will keep looking for these commodities, although basically these commodities are seasonal. Lack in supply or stock at certain times will make their price fluctuate.

The Indonesian consumers' preference for fresh chilies and shallots also becomes one of the causes of price fluctuation. Fresh chilies and shallots cannot be stocked so that it is important to make an accurate planning for their production and supply in order to meet the market demands. Nevertheless, people will still look for these commodities in spite of their high price due to their sustainable utility value.

The amount of supply to wholesale markets very much depends on the production level and distribution system from the producer area. Distribution system that can be clearly traced will give an assurance about the commodity availability in the markets. Accurate information on demands and the amount of supply will also make the supplied commodities in the markets not too much or too little so that it will minimize the price fluctuation. Failure in this commodity distribution can cause a decrease and loss of value qualitatively and quantitatively due to a change in dimensions of time, distance, and temperature, and transportation means of each distribution activity link. (Perdana, 2011). Therefore, it is very important to have a distribution system with accurate, reliable, rapid data by giving information on the goods position and its transportation mode.

Kramat Jati and Cipinang wholesale markets are the main markets for producers (farmers)of rice, small chilies and shallots in Java Island, so that farmers feel like facing an oligopoly power when marketing their farming products, which eventually causes high prices. One of the trading systems that can minimize it is by applying auction market in the producer and consumer areas (Setiadi, 1999; Tourte, et.al 2004). This auction market will enable the farmers and the buyers (including industries) to meet, resulting in transparent prices and short distribution link.

Early warning system concerning price fluctuation can be seen from the price movements at PIKJ and PIBC. Information from the Directorate of Processing and Marketing of Agricultural Products the Ministry of Agriculture shows that the grocer's rice price at PIBC for May 2014 was Rp 7,400/Kg, still low compared to the consumer's WTP value, Rp 8,360/Kg. For small chilies and shallots, the government applies an import reference price to open an import gate for chilies as much as Rp 28,000/Kg and for shallots Rp. 25,700/Kg. Compared to the consumer's WTP value in this research, where small red chilies is Rp 47,000/kg and shallots is Rp 14,600/kg, the reference price for small red chilies is still lower, while that of shallots is higher than that of the consumer's WTP value. The high WTP value on small red chilies (*capsicum frutescence*) may be due to its taste characteristic and specific texture that cannot be substituted by other chilies. Besides that, this WTP value can also be influenced by the highly extreme price that once happened to red small chilies and shallots.

If the fluctuating price does happen in the markets, the government will import the commodities. Especially for rice, the government appoints the Logistic Affair Bureau (Badan Urusan Logistik/Bulog) to monopolize imported rice, while for small red chilies and shallots, the Ministry of Agriculture and the Ministry of Trade will arrange the import mechanisms. The newest regulation issued by the Ministry of Trade concerning small red chilies and shallots mentions that import can be carried out by registered importers and producer importers by considering the recommendation from the Ministry of Agriculture and reference price in the markets.

The registered importers will distribute imported chilies and shallots to the markets, while producer importers usually import dried products or powder to be used as materials for food processing industries. Distribution of imported chilies

and shallots to industries and markets needs a special attention to prevent manipulations or misapplication, considering that the Harmonized System (HS) used is the same.

Attention to restrictions and control of imported commodities need to be paid during this global era; moreover, in the year 2015 Indonesia will become the member of Asean Economic Community (AEC). By that time goods and services from neighboring countries will enter the domestic markets easily. Their products are usually attractive and have good quality. This condition can make consumers turn from local products to imported products.

Government will find difficulties to use quota or tariff methods to inhibit import so that it is necessary to use other methods that are not contrary to the WTO regulations. Another alternative method that can be used by the government is Special Safeguard Mechanism (SSM) or trade security measures through tariff increase because of import that result in price fluctuation in domestic markets which certainly inflict domestic producers (Hadiwiyono, 2014). Furthermore, the increase of income, education and proportion of city dwellers make the consumption pattern tend to turn to better quality and safer food products. In the end, the consumers will be ready to pay more for these products.

Conclusion

Based on the results of the research about food price stabilization in Indonesia, some conclusions can be made, namely the WTP value for small red chilies and rice is higher than the reference and grocer's price, whereas the WTP value for shallots is lower than the reference price. The amount of stock and supply influence the price of rice, small red chilies and shallots negatively. On the other hand, demands for red chilies and shallots still depend on import.

Policy Implications

Policy recommendation for stabilizing the given prices based on the analyzed results is considering the consumer's WTP value when determining the reference price in the markets. It is important to build integrated market information and distribution system with producer areas. Besides, a national wholesale market and auction market link which is based on a strong and legal concept needs to be developed, so that an integrated concept of interested parties can be accommodated. To fulfill consumer demands and reduce manipulations, there should be an increased control over types, quality, location, and transportation mode of imported and domestic commodities in distribution channel.

Recommendations and Further Research

Further research can expand the research scope by including many variables such as the role of banking institution in the market and inter-island trade. Study on Special Safeguard Mechanism and auction market application in Indonesia also needs to be carried out as one of the methods to prevent flood of imports and to stabilize domestic prices.

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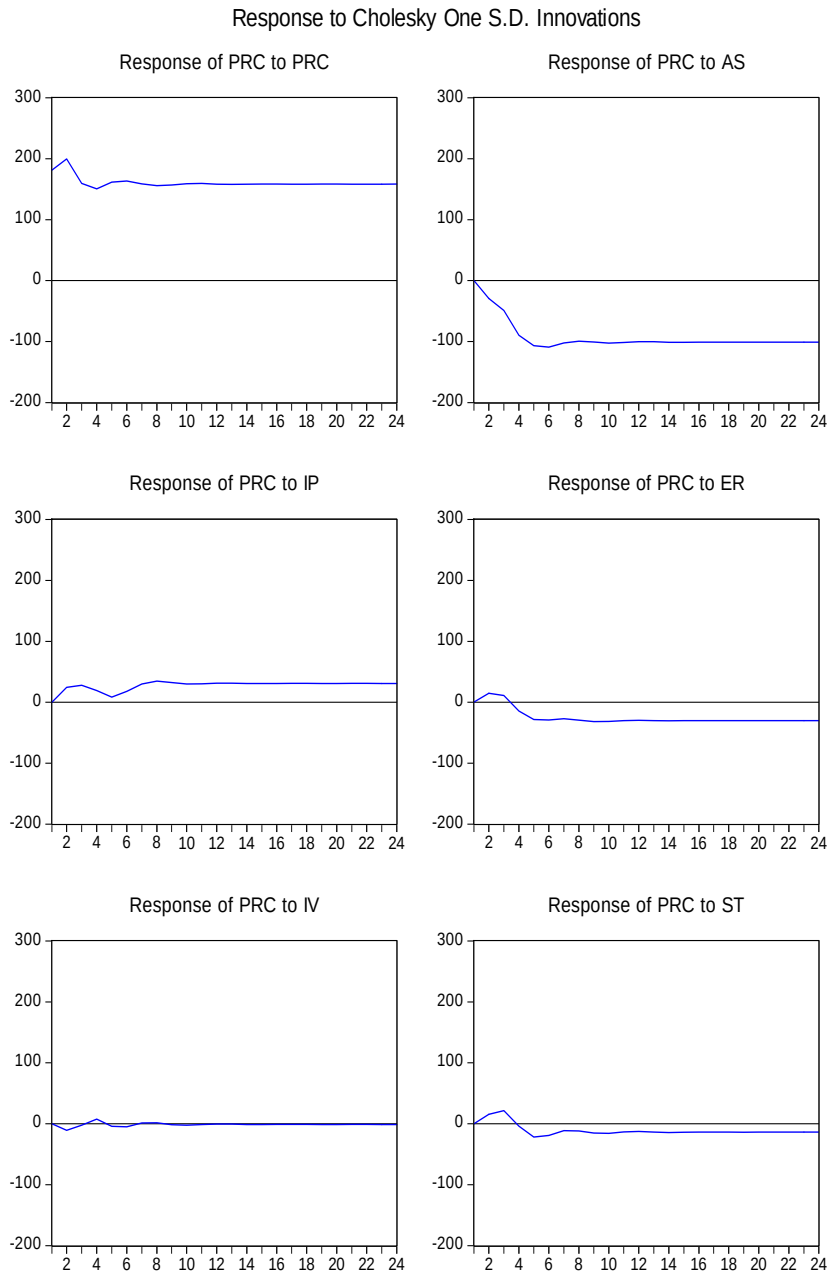
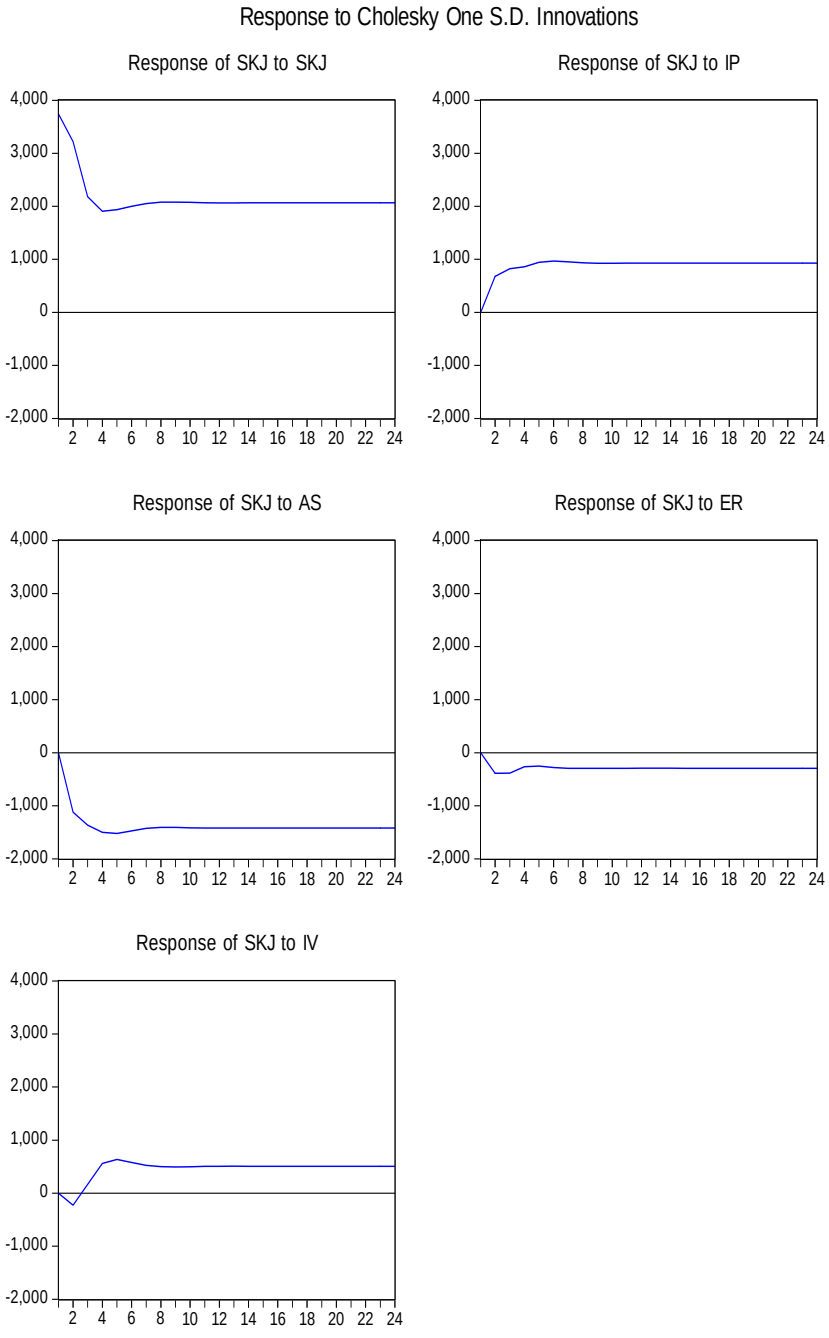
Appendix 1 Impulse Response Function

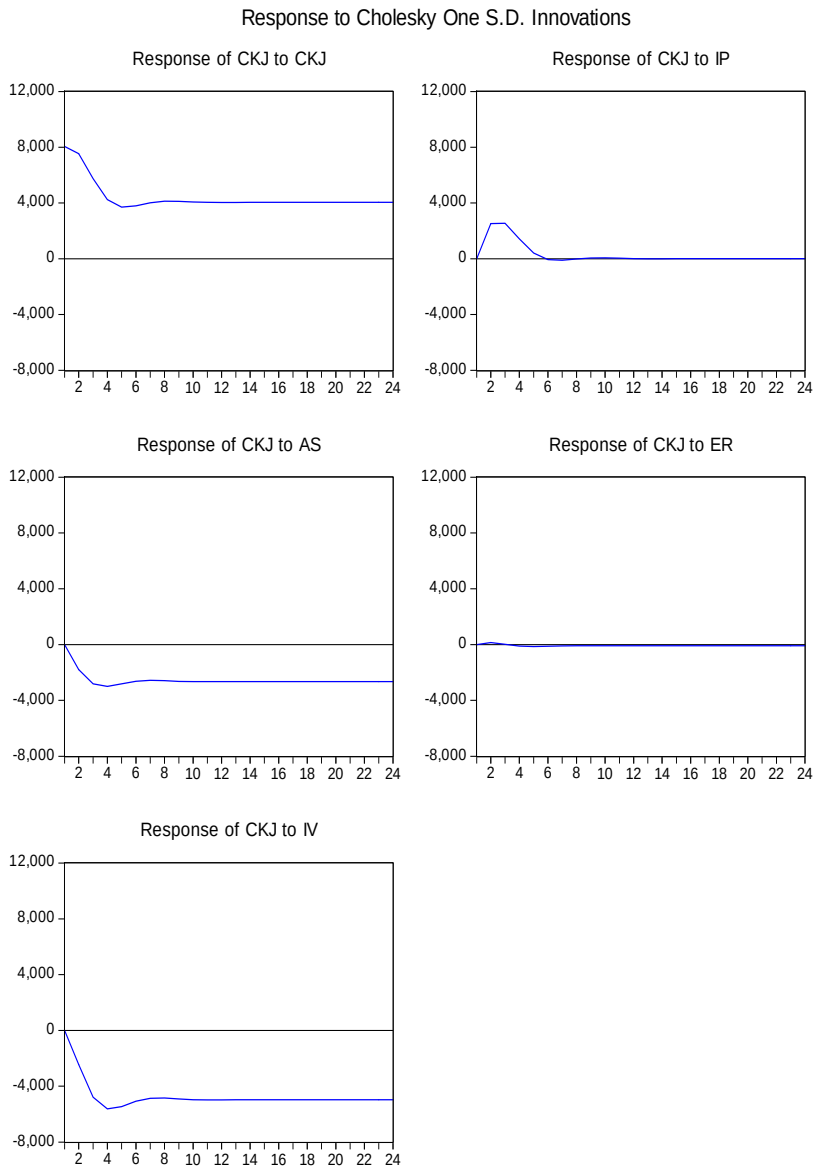
a. Rice



b. Small Red Chilies

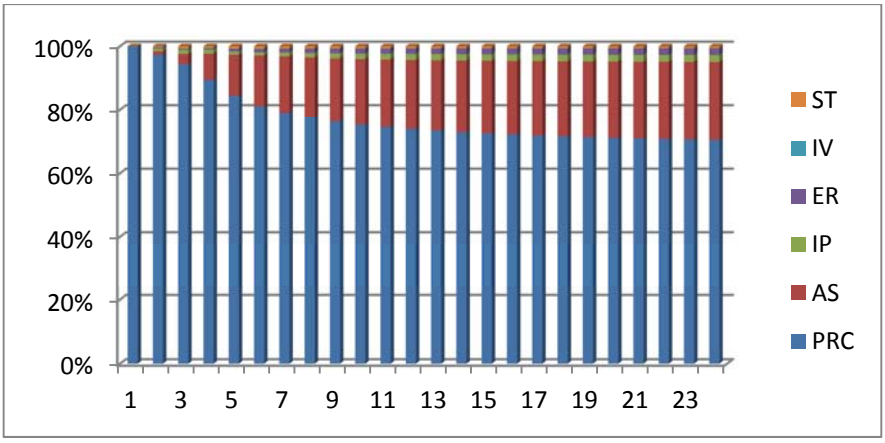


c. Shallots

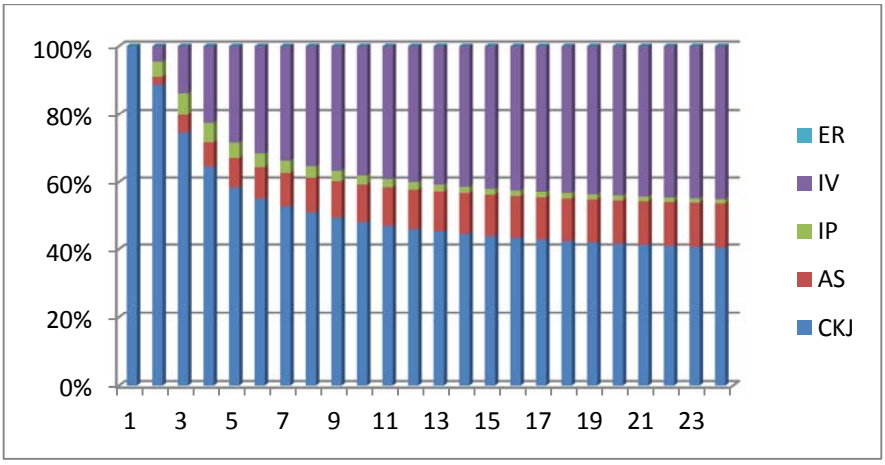

Response to Cholesky One S.D. Innovations
Response of CKJ to CKJ
Response of CKJ to IP
Response of CKJ to AS
Response of CKJ to ER
Response of CKJ to IV
12,000
8,000
4,000
0
-4,000
-8,000
2 4 6 8 10 12 14 16 18 20 22 24

Appendix 2 Forecast Error Variance Decomposition

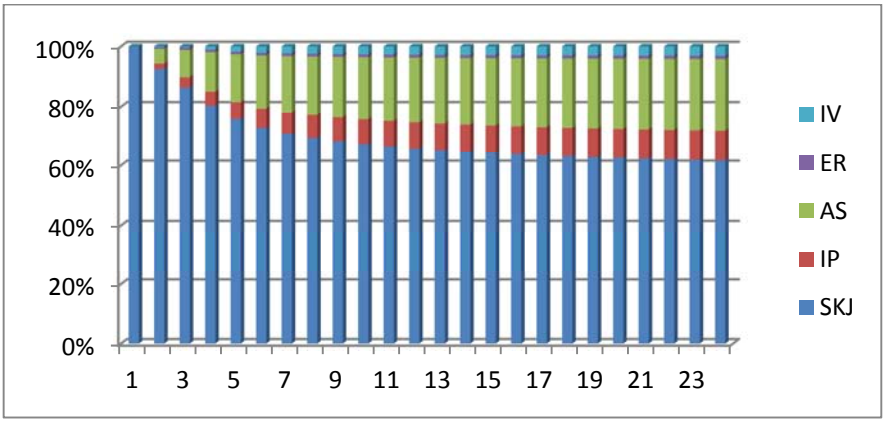
a. Rice



b. Small Red Chilies



c. Shallots



Appendix 3 Respondent Age Distribution

Age	Frequency (Rice)	Percentage (%)	Frequency (Small Red Chilies)	Percentage (%)	Frequency (Shallots)	Percentage (%)
19 – 24	0	0	0	0	0	0
25 – 35	4	20	4	20	0	0
36 – 50	13	65	10	50	14	70
51 - 65	3	15	6	30	6	30
> 65	0	0	0	0	0	0
Total	20	100	20	100	20	100

Appendix 4 Respondent Education Level Distribution

Education Level	Frequency (Rice)	Percentage (%)	Frequency (Small Red Chilies)	Percentage (%)	Frequency (Shallots)	Percentage (%)
Not School	0	0	0	0	0	0
SD	1	20	4	20	0	0
SMP	3	35	6	30	4	20
SMA	15	35	8	40	12	60
D3/S1	1	10	2	10	4	20
Total	20	100	20	100	20	100

Appendix 5 Respondent Family Members Distribution

Number of Family Members	Frequency (Rice)	Percentage (%)	Frequency (Small Red Chilies)	Percentage (%)	Frequency (Shallots)	Percentage (%)
3	7	35	1	5	0	0
4	7	35	7	35	8	40
5	3	15	5	25	6	30
6	3	15	5	25	4	20
7	0	0	1	5	1	5
8	0	0	1	5	1	5
Total	20	100	20	100	20	100

Appendix 6 Respondent Income Distribution

a. Rice

Income Level	Frequency	Percentage (%)
< Rp 50,000,000	3	15
Rp 50,000,001 – 100,000,000	15	75
Rp 100,000,001 – 150,000,000	2	10
> Rp 150,000,001	0	0
Total	20	100

b. Small Red Chilies and Shallots

Income Level	Frequency (Small Red Chilies)	Percentage (%)	Frequency (Shallots)	Percentage (%)
< Rp 30,000,000	1	5	0	0
Rp 30,000,001 – 60,000,000	8	40	10	50
Rp 60,000,001 – 90,000,000	9	45	8	40
> Rp 90,000,001	2	10	2	10
Total	20	100	20	100

Appendix 7 WTP Value Distribution

a. Rice

No	WTP Value (Rp)	Frequency	Relative Frequency (Pfi)	Mean WTP (Rp/person)	Total WTP (Rp/person)
1	7,100	1	0.05	355	7,100
2	7,400	1	0.05	370	7,400
3	8,000	1	0.05	400	8,000
4	8,300	5	0.25	2075	41,500
5	8,600	12	0.6	5160	103,200
	Total	20	1	8360	167,200

b. Small Red Chilies

No	WTP Value (Rp)	Frequency	Relative Frequency (Pfi)	Mean WTP (Rp/person)	Total WTP (Rp/person)
1	30,000	2	0.1	3,000	60,000
2	35,000	2	0.1	3,500	70,000
3	40,000	4	0.2	8,000	160,000
4	50,000	6	0.3	15,000	300,000
5	55,000	4	0.2	11,000	220,000
6	65,000	2	0.1	6,500	130,000
	Total	20	1	47,000	940,000

c. Shallots

No	WTP Value (Rp)	Frequency	Relative Frequency (Pfi)	Mean WTP (Rp/person)	Total WTP (Rp/person)
1	12,000	1	0.05	600	12,000
2	13,000	2	0.10	1,300	26,000
3	14,000	1	0.05	700	14,000
4	15,000	16	0.80	12,000	240,000
	Total	20	1	14,600	292,000