# SHALLOT SPATIAL MARKET INTEGRATION BETWEEN SURPLUS AND DEFICIT AREAS

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# SHALLOT SPATIAL MARKET INTEGRATION BETWEEN SURPLUS AND DEFICIT AREAS

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## ABSTRACT

Shallot is an important commodity in several countries so that it is a commodity that is widely traded internationally. Shallots for the Indonesian people are one of the staple foods that determine inflation. Shallot production potential for Indonesia is not evenly distributed, there are areas of surplus and there are areas of deficit so that there is an opportunity for an imbalance between supply and demand. This difference causes price disparities between surplus and deficit regions if markets are not integrated. The literature on the results of studies on spatial market integration between surplus and deficit areas in traditional markets and modern markets for shallots has not been widely found. Using time series data, shallot commodity prices for the period July 2016-May 2020. Using market prices spatially, namely prices in traditional markets and modern markets in the city of Surabaya (surplus) and prices in Kupang (deficit). Market integration analysis uses Johansen co-integration, Granger causality and VAR-VECM. The results of the study found that the Shallot price between the surplus and deficit markets are integrated into the long run but in the short run it is not perfectly integrated. There is no causality relationship between markets. Markets have a mechanism for adapting themselves to changing situations in the market. The influence of marketing infrastructure, transportation and the often uncertain drive of demand is driving the situation. Information asymmetry occurs as a result of these conditions. Policies on infrastructure improvement and market information disclosure to ensure a balance of supply and demand need to be a priority.

**KEY WORDS**
Shallots, surplus and deficit, cointegration, VAR-VECM.

There are many international trade transactions for the shallot commodity China controls the market share of shallots in the world. So that the price is mostly influenced by international prices other than domestic. The price of international shallots is always lower than Indonesia (Ministry of Trade of the Republic of Indonesia 2014).

Production of shallots in Indonesia still depends on the season and potential for the agro-climate, so that seasonal production is also not available in all regions in Indonesia. There are areas that are in surplus because of the potential for agro-climates, which are generally in the western part of Indonesia (such as Surabaya, the capital city of East Java Province) and many deficit areas are in eastern Indonesia, such as the province of East Nusa Tenggara (NTT). The province of NTT is known as a semi-framed archipelago which has constraints on the production and distribution of food commodities, particularly staple foods such as shallots. The main problem in NTT which is from the marketing side are the lack of food production. Shallots are always in deficit every year. So they must be supplied from to NTT, one of which is from Surabaya which is a surplus. The spatial relationship between the two shallot markets between NTT (Kupang) and Surabaya often experiences ups and downs due to the imbalance of supply and demand, especially between the harvest season and the garden season. This imbalance causes price fluctuations. Speculators have the opportunity to use erratic fluctuations in prices by sett prices (acting as price makers), while traders in traditional and modern markets and consumers are only price takers. The consequence of rising food prices can have an impact on increasing poverty, (Sa'diyah et al, 2019).

These considerations, research on the spatial integration of the shallot market between surplus and deficit areas is important to do. Several literature findings from market integration study using the Johansen cointegration approach, Granger causality and VECM were carried out by Ghafoor and Aslam, 2012 on the rice market in Pakistan; Traub et al, 2014 South African and Mozambique maize markets; Akhter 2017, on rice markets in India, Bangladesh and Nepal; Roman 2020, the dairy market in Poland; Ozturk 2020, on the wheat market in Turkey; Nigatu and Adjemian 2020, on the markets for corn, soybeans and cotton between U.S. and international prices. A study conducted in Indonesia by Cahyaningsih et al. (2012), on the Indonesian rice market; Irawan, and Rosmayanti 2016, regarding the rice market in Bengkulu; Hanani et al, 2020, about the cayenne pepper market in Malang, Indonesia. The study found varied conclusions, depending on the types of commodities, policies of each country, geographical conditions, the behaviour of marketing institutions and the socio-political and infrastructure situations.

Information about the dynamics of spatial market integration between supposes areas and the deficit of shallots on prices in traditional and moderate markets have not been widely found. A spatially integrated market, if prices in one market are related to price movements away a positive way, it follows the law of one price "LOP" (the law of one price), so that the market is said to be efficient because every market participant gets a fair profit. The marketing system is unfair if the opposite happen, it is not integrated; therefore, a market position experiencing a deficit has the potential to come under pressure and losses from a surplus market. The results of the study on spatial market integration and price fluctuations of shallots are very useful for policy makers and those with an interest in predicting future price dynamics so as to anticipate the risk of large losses.

## METHODS OF RESEARCH

This study uses price data presented by the data centre of national strategic food prices for shallot commodities in traditional and modern markets. The data form is the monthly time series for the period June 20160-May 2020. The data objects include markets in areas where shallots are surplus and deficit, namely Surabaya and Kupang. East Java Province is the largest province with the head as a centre of shallot production of Indonesia. Meanwhile, NTT is the province with the most deficit (BPS, 2017). The price of shallots in East Java uses the price in (City) Surabaya and NTT uses (City) Kupang. The two cities are provincial capitals which are the centre of trade transactions.

*Spatial Market Integration Analysis Method*. Data analysis method to see the level of spatial market integration in traditional and modern markets between the surplus and deficit areas of garlic, using the Vector Autoregression (VAR) - Error Correction Model (VECM) model. The formation of the VAR-VECM model includes stationary and cointegration problems. The stages of finding the VAR-VECM model, in the analysis of market integration are shown in Figure 1.

The data stationary test uses the Augmented Dickey-Fuller (ADF) approach at a price level or different to get stationary data (Nendissa et al, 2018; Kapioru 2020), that is, the variance has a tendency to approach its average value (Enders, 1995). ADF tested to see the trend of shallot price data movements, with a formula:

$$\Delta P_t = \alpha_0 + \gamma_1 P_{t-1} + \beta_I \sum_{I=1}^{m} \Delta P_{t-1} + \varepsilon_{it}$$

Where:
- $P_t$ = Price of shallots in each market in period t (Rp / kg);
- $P_{t-1}$ = The price of shallots in each market in the previous t period (Rp / kg);
- $\Delta P_t = P_t - P_{t-1}$;
- $\Delta P_{t-1} = P_{t-1} - \Delta P_{(t-1)-1}$;
- m = amount of lag;
- $\alpha_0$ = intersep;
- $\alpha, \beta, \gamma$ = Parameter coefficient;
- $\varepsilon_t$ = Error term.

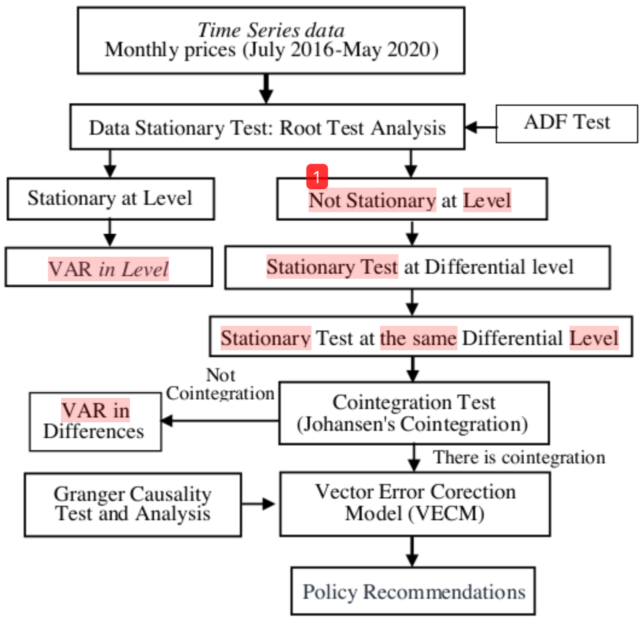


Figure 1 – Stages of VAR-VECM Model Formation (modification from Widarjono 2018; Basuki and Prawoto, 2017)

Hypothesis test:
- $H_0: \gamma = 0$ time series data is not stationary;
- $H_1: \gamma < 0$ stationary time series data.

Testing criteria:

1. If the ADF statistical> ADF is critical, then reject Ho, meaning that the price data is not stationary;
2. If the ADF statistic ≤ ADF is critical, then accept Ho, it means that the price data is stationary.

*Determination of Optimal Lag.* The optimal lag length is needed to see the effect of each variable on other variables in the VAR model, using the Akaike Information Criteria (AIC). The criterion that has the smallest AIC and SIC values is the lag used.

*Cointegration Test.* The cointegration test uses Johansen's Cointegration Test, to find out whether there is integration or not (Hjalmarsson & Osterholm, 2010; Mensah et al, 2017; Naidu et al, 2017; Tursoy, 2019). The long run equation is defined as follows:

$$Y = C + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \varepsilon$$

Where: *Y* = dependent variable; *C* = constant; *β* = estimate value; *X* = independent variable; *ε* = residual.

If in the test, there is no cointegration relationship, the analysis is carried out using the VAR difference method, and if there is a cointegration relationship, VECM analysis is carried out using the Johansen test.

*Granger Causality Test.* The Granger causality test is used to see the short-term causality of each variable that has root and is co-integration (Bhutto et al, 2020; Higgoda R & Madurapperuma, 2020; Rizwanullah et al, 2020; Hu et al, 2020; Mohamed, 2020). The Granger causality test is a statistical hypothesis test to determine whether one time series is useful in predicting another (Hood et al, 2008; Fanchette et al, 2019; Ptackova et al, 2019; Plub-in, & Songsiri, 2019; Zhang et al, 2020).

*VECM tests.* The VECM model is used to overcome data instability, where this model will gradually correct the imbalance, deviation through short-term partial adjustment (Enders, 1995; and Gujarati, 2004; Nkalu et al, 2020; Ters, & Urban, 2020; Molin, 2020; Giudici & Pagnottoni, 2020). The general form of VECM (p) where p is the lag of the endogenous variable with cointegration rank r ≤ k is as follows:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-1} + D_t + \varepsilon_t$$

Where:

- $\Delta$ = differencing operators, with $\Delta y_t = y_t - y_{t-1}$;
- $y_{t-1}$ = endogenous variable vector with *lag* to-1;
- $\varepsilon_t$ = error vector with size (k x 1);
- $D_t$ = *constant vector with size* (k x 1);
- ∏ = cointegration coefficient matrix with ∏ - $\alpha\beta^t$;
- α = vector adjustment, size matrix (k x r);
- β = cointegration vector with size matrix (k x r);
- $\Gamma_i$ = coefficient matrix (k x k) the coefficient of endogenous variables k-i (Lutkepohl, 2005).

Several stationary exogenous variables can be included as additional regressors along with some of the lags with the following equation:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-1} + \sum_{i=0}^{s} \Phi_i \, X_{t-1} + D_t + \varepsilon_t$$

Where:

- $\Delta$ = Differencing operators, with $\Delta y_t = y_t - y_{t-1}$;
- $y_{t-1}$ = *endogenous variable vector with lag* to-1;
- $\varepsilon_t$ = *error vector with size* (k x 1);
- $D_t$ = *constant vector with size* (k x 1);
- ∏ = cointegration coefficient matrix with ∏ - $\alpha\beta^t$;
- α = *vector adjustment, size matrix* (k x r);
- β = cointegration vector with size matrix (k x r);
- $\Gamma_i$ = coefficient matrix (k x k) endogenous variable coefficient to-i;
- Φ = coefficient vector (1 x k) exogenous variables to-i.

The VECM model used in this study is as follows:

$$\Delta PKa_t = \alpha_0 + \sum_{I=1}^{p} \alpha_i \Delta PKa_{t-1} + \sum_{I=1}^{p} \beta_i \Delta PKo_{t-1} + \varepsilon_{1t}$$

$$\Delta PKo_t = \delta_0 + \sum_{I=1}^{p} \delta_i \Delta PKa_{t-1} + \sum_{I=1}^{p} \sigma_i \Delta PKo_{t-1} + \varepsilon_{1t}$$

$$\Delta PJk_t = \theta_0 + \sum_{I=1}^{p} \theta_i \Delta PKa_{t-1} + \sum_{I=1}^{p} \omega_i \Delta PKo_{t-1} + \varepsilon_{1t}$$

Where:

- $\Delta PSa_t$ = The price of shallots in the modern market of Surabaya in the period to $-t$ (Rp/Kg);
- $\Delta PKa_{t-1}$ = The price of shallots in the modern Kupang market in period to-t, before (Rp/kg);
- $\Delta PSo_t$ =Price of shallots in Surabaya traditional markets period to-t (Rp/Kg);
- $\Delta PKo_{t-1}$ = Price of shallots in Kupang traditional markets, period to $-$ t, before (Rp/Kg);
- $\alpha, \delta, \theta, \beta, \gamma, \sigma, \phi, \omega, \varphi$ = regression coefficient;
- $\varepsilon_{it}$ = *error term* ke $- i$, waktu ke $- t$.

## RESULTS AND DISCUSSION

Shallot production of Indonesia is concentrated on the island of Java, because it generally has very good agro-climatic conditions and land for shallot cultivation. East Java Province is the second largest shallot producing province after Central Java, followed by West Java, then NTB and others outside Java (BPS 2017). From the aspect of total production, East Java experiences an overproduction (surplus) almost every year, so that East Java becomes one of the main suppliers of shallots to deficit areas, one of which is NTT.

*Data Stationarity Test.* The results of the stationary test based on the ADF test or the DF test of Table 1, showed that data is not stationary at the level or integration level of zero, I(0), so the time-series economic model stationary requirements can be obtained by difference data at the 1st difference level.

Table 1 – Stationarity test results using the ADF Test approach

| Variable | Unit Root Test: Level ADF | Level Prob. | 1st Difference ADF | 1st Difference Prob. | Information |
|---|---|---|---|---|---|
| Modern_Kupang | -2.521976 | 0.1118 | -8.859378 | 0.0000* | Stationary |
| Traditional _Kupang | -2.315400 | 0.1682 | -12.07558 | 0.0000* | Stationary |
| Modern_Surabaya | -2.122807 | 0.2360 | -15.89345 | 0.0000* | Stationary |
| Traditional _ Surabaya | -2.134123 | 0.2316 | -14.31119 | 0.0000* | Stationary |

*Source: Secondary data, 2020.*

*Determination of Lag Length.* The variable data is stationary at the 1st Difference level, so the estimation is expected to produce a valid model output. VAR model estimation starts with determining the appropriate lag length of the VAR model.

Table 2 – Results of the Optimal Lag Determination Test

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -6961.317 | 0.00000 | 8.17e+25 | 73.31912 | 73.38748 | 73.34682 |
| 1 | -6829.552 | 256.5939 | 2.42e+26 | 72.10055 | 72.44234 | 72.23901 |
| 2 | -6786.743 | 81.56336 | 1.82e+26 | 71.81835 | 72.43357* | 72.06756 |
| 3 | -6754.126 | 60.77037 | 1.53e+26* | 71.64343* | 72.53209 | 72.00341* |
| 4 | -6738.721 | 28.05239* | 1.54e+26 | 71.64970 | 72.81179 | 72.12045 |
| 5 | -6724.096 | 26.01755 | 1.57e+26 | 71.66417 | 73.09970 | 72.24568 |
| 6 | -6714.544 | 16.59016 | 1.68e+26 | 71.73205 | 73.44101 | 72.42432 |
| 7 | -6706.826 | 13.07976 | 1.84e+26 | 71.81923 | 73.80162 | 72.62226 |
| 8 | -6696.428 | 17.18454 | 1.96e+26 | 71.87819 | 74.13402 | 72.79199 |

The result of the lag length test of VAR by entering AIC shows the optimal lag length is 3 with an AIC value of 71.64343*.

*Cointegration tests.* The results of the Johansen cointegration test of Table 3 show that the value of Trace Statistics> Critical values / valued with Prob <0.05 means that there is an integration of shallot prices in the long run for / of the Kupang modern and traditional Kupang markets.

Table 3 – Johansen Cointegration Test between Markets in Modern Kupang and Traditional Kupang markets

| Hypothesized No. of CE(s) | Trace Statistic | 0.05 Critical Value | Prob.** | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|---|---|
| None * | 21.70332 | 15.49471 | 0.0051 | 18.15112 | 14.26460 | 0.0116 |
| At most 1 | 3.552196 | 3.841466 | 0.0595 | 3.552196 | 3.841466 | 0.0595 |

*Source: Secondary data processed, 2020. Error level (α) = 0.05.*

Changes in prices for modern Kupang and traditional Kupang have a relationship in the long term, but in the short term it is unlikely to happen.

Table 4 – Johansen Cointegration Test between modern Kupang Markets and Modern Surabaya

| Hypothesized No. of CE(s) | Trace Statistic | 0.05 Critical Value | Prob.** | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|---|---|
| None * | 20.54135 | 15.49471 | 0.0080 | 16.70772 | 14.26460 | 0.0201 |
| At most 1 | 3.833626 | 3.841466 | 0.0502 | 3.833626 | 3.841466 | 0.0502 |

*Source: Secondary data processed, 2020. Error level (α) = 0.05.*

The results of the Johansen cointegration test in Table 4 show that the value of Trace Statistics> Critical value with Prob <0.05 means that there is an integration of shallot prices in the long run between the modern Kupang market and modern Surabaya.

Table 5 – Johansen cointegration test between Kupang traditional markets and traditional Surabaya

| Hypothesized No. of CE(s) | Trace Statistic | 0.05 Critical Value | Prob.** | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|---|---|
| None * | 44.82258 | 15.49471 | 0.0000 | 38.23987 | 14.26460 | 0.0000 |
| At most 1 | 6.582708 | 3.841466 | 0.0103 | 6.582708 | 3.841466 | 0.0103 |

*Source: Secondary data processed, 2020. Error level (α) = 0.05.*

The results of the Johansen cointegration test of Table 5 show that the value of Trace Statistics> Critical values with Prob <0.05 means that there is an integration of shallot prices in the long term between traditional Kupang markets and traditional Surabaya. The results of the research by Kapioru, et al. (2020) between prices in traditional markets and prices at wholesalers in NTT in the long term that integration occurs.

Table 6 – Johansen cointegration test for modern Surabaya markets and traditional Surabaya

| Hypothesized No. of CE(s) | Trace Statistic | 0.05 Critical Value | Prob.** | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|---|---|
| None * | 18.98671 | 15.49471 | 0.0143 | 14.50852 | 14.26460 | 0.0458 |
| At most 1 | 4.478190 | 3.841466 | 0.0343 | 4.478190 | 3.841466 | 0.0343 |

*Source: Secondary data processed, 2020. Error level (α) = 0.05.*

The results of the Johansen cointegration test of Table 6 show that the Trace Statistics> Critical values with Prob <0.05 means that there is an integration of shallot prices in the long run for the modern Surabaya market and traditional Surabaya.

*Granger Causality.* Test The causality test is to see the reciprocal relationship between prices spatially between surplus and deficit areas in traditional and modern markets.

Table 6 – Granger Causality Test, between markets in surplus and deficit areas

| Null Hypothesis: | Obs. | F-Statistic | Prob. |
|---|---|---|---|
| MODERN_SURABAYA doesn't Granger Cause MODERN_KUPANG | 197 | 2.43531 | 0.0903 |
| MODERN_KUPANG doesn't Granger Cause MODERN_SURABAYA | | 102.203 | 6.E-31 |
| TRADITIONAL_KUPANG doesn't Granger Cause MODERN_KUPANG | 197 | 9.37923 | 0.0001 |
| MODERN_KUPANG does not Granger Cause TRADITIONAL_KUPANG | | 0.01526 | 0.9849 |
| TRADITIONAL_SURABAYA doesn't Granger Cause MODERN_KUPANG | 197 | 7.53351 | 0.0007 |
| MODERN_KUPANG does not Granger Cause TRADITIONAL_SURABAYA | | 0.00267 | 0.9973 |
| TRADITIONAL_KUPANG doesn't Granger Cause MODERN_SURABAYA | 197 | 7.38170 | 0.0008 |
| MODERN_SURABAYA doesn't Granger Cause TRADITIONAL_KUPANG | | 0.83674 | 0.4347 |
| TRADITIONAL_SURABAYA does not Granger Cause MODERN_SURABAYA | 197 | 6.90459 | 0.0013 |
| MODERN_SURABAYA doesn't Granger Cause TRADITIONAL_SURABAYA | | 1.31295 | 0.2714 |
| TRADITIONAL_SURABAYA doesn't Granger Cause TRADITIONAL_KUPANG | 197 | 0.46069 | 0.6315 |
| TRADITIONAL_KUPANG doesn't Granger Cause TRADITIONAL_SURABAYA | | 157.160 | 4.E-41 |

*Source: Secondary data processed, 2020. Error level (α) = 0.05.*

The results of the Granger causality test, which are presented in table 6, show that spatially there is a two-way causality relationship that only occurs to modern markets in Kupang and modern markets in Surabaya. Meanwhile, the relationship between other markets is only a one-way relationship. This gives an indication that the relationship between markets does not influence each other, except in modern markets in areas of surplus and deficit. Figure 2 provides an illustration of the causality relationship.

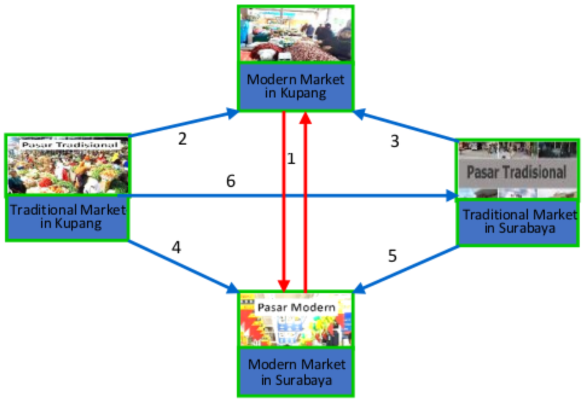


Figure 2 – Illustration of Causality Relationship between Surplus (Surabaya) and Deficit (Kupang) Areas in Modern and Traditional Markets.

The existence of a causal relationship between modern markets in surplus and deficit areas indicates that the modern markets in Surabaya and Kupang are interrelated, because generally shallots sold in modern markets in Kupang are from their business partners in Surabaya. A modern market in the form of a Hypermart which has business partners with Surabaya. So that any price changes that occur to the Surabaya modern market are transmitted directly to the Kupang modern market, because the market information system is running fast. Whereas the other three markets relationships do not have a causal relationship, there is a possibility of information asymmetry, market infrastructure constraints and inefficient demand and supply mechanisms. This is supported by the results of the study (Goletti et al., 1995; Suryana et al., 2014), the absence of spatial integration suggests that price changes in one producer market are not reflected as price changes in geographically different producer markets. Other reasons for the absence of market integration are the distance between cities, infrastructure, road transport flows by Varela et al. (2012); and Hidayanto et al, 2014). The effect of commodity trading policies by Sexton et al, (1991) and Aryani (2009). There is no comprehensive integration in all markets in the long term (Adiyoga et al, (1999).

This means that the pressure on the demand for shallots in the traditional Kupang market as a deficit area becomes a stimulus for prices that are formed in the market surplus in the short term. This condition is often used by inter-island wholesalers to determine prices. The findings of a study by Kapioru et al, (2020) on the commodity of red chili in NTT show that price changes in traditional markets and prices in wholesalers do not have a causal relationship. Changing prices at wholesalers prompted red chili prices in traditional markets to change, but the reverse did not happen. The findings of Akhter's (2017) study show that the domestic rice prices of India, Bangladesh and Nepal are integrated in the short and long term, even though India has imposed export restriction policies. Akhter suspects that the price of rice is being transmitted effectively because of the informal cross-border trade that extends over the porous border between India, Bangladesh and Nepal.

*Vector Autoregression (VAR) tests.* The vector auto regression_(VAR) test is intended because the data is not stationary which has been derived based on the optimal lag, namely the optimal lag 4. The cointegration test variable data shows that there is no cointegration between all price variables in the three markets, this indicates that there is no relationship or imbalance modern Kupang market, traditional Kupang, modern Surabaya and traditional Surabaya in the long run. However, in the short term there is a possibility of integration. So it is necessary to apply a VAR / VARD test approach. The VAR / VARD test results are displayed in appendix The estimation results based on the VARD model in the attachment to Table 1, show that in the short term changes in the price of shallots in the modern Kupang market are significantly influenced by prices in the market, modern Surabaya one month earlier was 1.321, modern Surabaya two months earlier was 0.800 and modern Kupang itself two months earlier at - 2,806. This value indicates that each increase in the price of modern market shallots in Surabaya one month earlier, modern Surabaya two months earlier and modern Kupang two months earlier by 1%, It will increase prices in the modern market in Kupang in the current period respectively by 1.321% and 0.800% and There was a decline in the price of shallots in the previous two months in the modern Kupang market by 0.2806. Meanwhile, the price of shallots in the Kupang traditional market was significantly influenced by the price of the traditional Surabaya market in the previous month of 1.084, two months earlier of 0836, the previous three months of 0.343. The previous month and the previous three months by 1%, It will reduce the market price in Surabaya traditional markets in the current period respectively by 1.084%, 0.836% and 0.343%.

The estimation results based on the VARD model in the appendix to Table 1, show that in the short term changes in the price of shallots in the modern Kupang market are significantly influenced by prices in the modern market of Surabaya one month earlier of 1.321, modern Surabaya two months earlier of 0.800 and modern Kupang itself two the previous month was -2,806. This value indicates that each increase in the price of modern market shallots in Surabaya one month earlier, modern Surabaya two months earlier and modern Kupang two months earlier by 1%, It will increase prices in the modern market in Kupang in the current period respectively by 1.321% and 0.800% and There was a decline in the price of shallots in the previous two months in the modern Kupang market by 0.2806. Meanwhile, the price of shallots in the Kupang traditional market was significantly influenced by the price of the traditional Surabaya market in the previous month of 1.084, two months earlier of 0836, the previous three months of 0.343. The previous month and the previous three months by 1%, It will reduce the market price in Surabaya traditional markets in the current period respectively by 1.084%, 0.836% and 0.343%.

Changes in the price of shallots in Surabaya traditional markets are significantly influenced by prices in Surabaya traditional market itself one month before of - 0,912, two months earlier of - 0,581 and three months earlier of - 0,226, In traditional markets of Surabaya one month earlier of 1,047, meaning that each the increase in prices in the traditional market in Surabaya in one month, two months earlier and three months earlier by 1% will reduce prices in the traditional market in Surabaya in the current period by 0.912%, 0.581% and 0.226%. Meanwhile, price changes in the modern market in Surabaya were significantly influenced by the price of the modern market in Surabaya itself one month earlier, which was - 0,989, In the previous two months it was - 0.671, meaning that each price increase in the modern Surabaya market in modern Surabaya in the current period was 0.989 and 0.671%.

*Vector Error Correction Model (VECM) tests*. The VECM test results from Appendix 2, show that ECT at traditional prices in Surabaya is significant at the 5% error level, namely -0.095 (-0.4752 <-.97196). Significant ECT values "indicate that the importance of long-term cointegration relationships in the process of forming shallot prices among market players. Price changes are influenced by the long-term relationship between modern Kupang market and modern Surabaya and modern Surabaya and modern Surabaya itself one month before and two months before. In the short term, changes in the modern market prices in Kupang are only influenced by changes in prices in the modern market in Surabaya one month earlier at 1,309. This value indicates that each 1% increase in prices in the modern market in Surabaya in the previous month will increase the modern market price of Kupang in the current period by 1.309%. Meanwhile, the short term change in the price of shallots in the modern market in Surabaya was influenced by the price of shallots in the modern Surabya market itself in the previous month and in the previous two months of - 0.978 and - 0.661. This means that every 1% increase will reduce the price of shallots in the modern Surabaya market in the current period by 0.978% and 0.661%, respectively. Thus, the transmission mechanism and market integration do not always show a consistent pattern. Every market has a mechanism for responding to changes, because many factors determine the effectiveness of spatial market integration. Several studies on the determinants of market integration found that.

## CONCLUSION

The price relationship to between traditional and modern markets between the surplus and deficit regions is not perfect. The price relationship between all the two markets is only a one-way relationship. This means that there is no integration between markets, except between modern markets in surplus areas (Surabaya) and deficits (Kupang) where there is a causal relationship. This is because the modern markets in the two regions are trading partners that have a perfect flow of information so that the law of one price (LOP) applies. Meanwhile, price relationships between other markets, namely between traditional markets, between traditional and modern markets, do not have a causal relationship. The role of traders in surplus areas is in taking advantage of the imbalance opportunity in supply and fever to regulate the price of shallots in deficit areas. Marketing infrastructure constraints, asymmetric distance information and transportation are the determinants of spatial market integration. Improvement on market infrastructure, information disclosure and compliance with prices as well as maintaining the security of shallot stock need to be a joint commitment, especially policy makers.

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## APPENDIX

APPENDIX 1 – VAR tests / tested for the VARP test, in Kupang Modern Market, Kupang Traditional, Modern Surabaya and Surabaya Traditional Markets

| | D(MODERN_ KUPANG) | D(TRADITIONAL _ KUPANG) | D(TRADITIONAL_ SURABAYA) | D(MODERN_ SURABAYA) |
|---|---|---|---|---|
| D(MODERN_KUPANG(-1)) | 0.516052 | 0.049767 | 0.020684 | 1.321149 |
| | (0.08061) | (0.10012) | (0.08252) | (0.11488) |
| | [ 6.40160] | [ 0.49706] | [ 0.25067] | [ 11.5007] |
| D(MODERN_KUPANG(-2)) | -0.280567 | -0.025789 | 0.002794 | 0.800895 |
| | (0.12185) | (0.15135) | (0.12473) | (0.17365) |
| | [-2.30247] | [-0.17040] | [ 0.02240] | [ 4.61222] |
| D(MODERN_KUPANG(-3)) | -0.133048 | 0.138983 | 0.075811 | 0.324754 |
| | (0.14402) | (0.17887) | (0.14741) | (0.20523) |
| | [-0.92385] | [ 0.77700] | [ 0.51427] | [ 1.58242] |
| D(TRADITIONAL _KUPANG(-1)) | 0.112265 | 0.298725 | 1.084834 | 0.102750 |
| | (0.07656) | (0.09509) | (0.07837) | (0.10911) |
| | [ 1.46629] | [ 3.14134] | [ 13.8423] | [ 0.94174] |
| D(TRADITIONAL KUPANG(-2)) | 0.075561 | 0.173531 | 0.836299 | 0.099735 |
| | (0.10900) | (0.13538) | (0.11157) | (0.15532) |
| | [ 0.69325] | [ 1.28185] | [ 7.49591] | [ 0.64212] |
| D(TRADITIONAL _KUPANG(-3)) | 0.124265 | -0.110968 | 0.343499 | 0.254974 |
| | (0.10390) | (0.12904) | (0.10635) | (0.14805) |
| | [ 1.19605] | [-0.85994] | [ 3.22996] | [ 1.72216] |
| D(TRADITIONAL SURABAYA(-1)) | -0.032454 | -0.177284 | -0.912336 | -0.131568 |
| | (0.08997) | (0.11175) | (0.09209) | (0.12821) |
| | [-0.36072] | [-1.58649] | [-9.90661] | [-1.02618] |
| D(TRADITIONAL SURABAYA(-2)) | -0.097479 | 0.032403 | -0.581632 | -0.227858 |
| | (0.09993) | (0.12412) | (0.10229) | (0.14240) |
| | [-0.97546] | [ 0.26107] | [-5.68616] | [-1.60009] |
| D(TRADISIONAL_SURABAYA(-3)) | 0.133185 | -0.009370 | -0.226967 | -0.020606 |
| | (0.06879) | (0.08544) | (0.07041) | (0.09803) |
| | [ 1.93613] | [-0.10967] | [-3.22338] | [-0.21020] |
| D(MODERN_SURABAYA(-1)) | -0.026645 | -0.067126 | -0.065396 | -0.989803 |
| | (0.05665) | (0.07036) | (0.05798) | (0.08072) |
| | [-0.47036] | [-0.95406] | [-1.12782] | [-12.2615] |
| D(MODERN_SURABAYA(-2)) | 0.231783 | -0.121669 | -0.092054 | -0.671188 |
| | (0.11710) | (0.14544) | (0.11986) | (0.16687) |
| | [ 1.97940] | [-0.83657] | [-0.76800] | [-4.02229] |
| D(MODERN_SURABAYA(-3)) | 0.026880 | -0.023746 | 0.039481 | -0.177327 |
| | (0.10111) | (0.12558) | (0.10350) | (0.14409) |
| | [ 0.26585] | [-0.18909] | [ 0.38147] | [-1.23070] |
| C | -22.67957 | 61.54727 | 33.73261 | -156.2568 |
| | (124.415) | (154.527) | (127.351) | (177.294) |
| | [-0.18229] | [ 0.39829] | [ 0.26488] | [-0.88134] |

*Source: Secondary data processed, 2020. T-table at 5% error level = 1.97196.*

APPENDIX 2 – VECM Test Results on Kupang Modern, Traditional Kupang, Modern Surabaya and Traditional Surabaya Markets

| Error Correction: | D(MODERN_ KUPANG) | D(TRADITIONAL _ KUPANG) | D(TTRADITIONAL_ SURABAYA) | D(MODERN_ SURABAYA) |
|---|---|---|---|---|
| CointEq1 | 0.023610 | 0.012091 | -0.095912 | 0.009901 |
| | (0.02084) | (0.02595) | (0.02018) | (0.02979) |
| | [ 1.13317] | [ 0.46586] | [-4.75283] | [ 0.33238] |
| D(MODERN_KUPANG(-1)) | 0.487117 | 0.034949 | 0.138233 | 1.309015 |
| | (0.08450) | (0.10526) | (0.08184) | (0.12081) |
| | [ 5.76464] | [ 0.33202] | [ 1.68898] | [ 10.8357] |
| D(MODERN_KUPANG(-2)) | -0.303530 | -0.037549 | 0.096082 | 0.791265 |
| | (0.12343) | (0.15376) | (0.11955) | (0.17647) |
| | [-2.45904] | [-0.24420] | [ 0.80368] | [ 4.48394] |
| D(MODERN_KUPANG(-3)) | -0.149351 | 0.130635 | 0.142038 | 0.317917 |
| | (0.14462) | (0.18015) | (0.14007) | (0.20675) |
| | [-1.03271] | [ 0.72514] | [ 1.01403] | [ 1.53766] |
| D(TRADITIONAL KUPANG(-1)) | 0.339516 | 0.415103 | 0.161646 | 0.198046 |
| | (0.21464) | (0.26738) | (0.20789) | (0.30686) |
| | [ 1.58178] | [ 1.55251] | [ 0.77754] | [ 0.64540] |
| D(TRADITIONAL _KUPANG(-2)) | 0.232929 | 0.254121 | 0.197008 | 0.165726 |
| | (0.17649) | (0.21985) | (0.17094) | (0.25231) |
| | [ 1.31981] | [ 1.15591] | [ 1.15252] | [ 0.65683] |
| D(TRADITIONAL _KUPANG(-3)) | 0.201604 | -0.071362 | 0.029317 | 0.287406 |
| | (0.12424) | (0.15476) | (0.12033) | (0.17762) |
| | [ 1.62269] | [-0.46111] | [ 0.24363] | [ 1.61811] |
| D(TRADITIONAL _SURABAYA(-1)) | -0.234825 | -0.280920 | -0.090221 | -0.216430 |
| | (0.19994) | (0.24906) | (0.19365) | (0.28584) |
| | [-1.17448] | [-1.12792] | [-0.46589] | [-0.75717] |
| D(TRADITIONAL _SURABAYA(-2)) | -0.223393 | -0.032079 | -0.070114 | -0.280660 |
| | (0.14939) | (0.18609) | (0.14469) | (0.21357) |
| | [-1.49536] | [-0.17238] | [-0.48457] | [-1.31411] |
| D(TRADITIONAL _SURABAYA(-3)) | 0.086776 | -0.033137 | -0.038433 | -0.040067 |
| | (0.08001) | (0.09967) | (0.07750) | (0.11439) |
| | [ 1.08453] | [-0.33247] | [-0.49593] | [-0.35027] |
| D(MODERN_SURABAYA(-1)) | -0.000331 | -0.053650 | -0.172295 | -0.978768 |
| | (0.06118) | (0.07621) | (0.05926) | (0.08747) |
| | [-0.00541] | [-0.70395] | [-2.90753] | [-11.1901] |
| D(MODERN_SURABAYA(-2)) | 0.254861 | -0.109851 | -0.185805 | -0.661511 |
| | (0.11877) | (0.14794) | (0.11503) | (0.16979) |
| | [ 2.14592] | [-0.74252] | [-1.61526] | [-3.89602] |
| D(MODERN_SURABAYA(-3)) | 0.039923 | -0.017067 | -0.013503 | -0.171858 |
| | (0.10169) | (0.12667) | (0.09849) | (0.14537) |
| | [ 0.39261] | [-0.13474] | [-0.13710] | [-1.18218] |
| C | -25.61046 | 60.04633 | 45.63907 | -157.4859 |
| | (124.345) | (154.894) | (120.435) | (177.768) |
| | [-0.20596] | [ 0.38766] | [ 0.37895] | [-0.88591] |
| R-squared | 0.303739 | 0.102978 | 0.592736 | 0.566160 |
| Adj. R-squared | 0.253732 | 0.038551 | 0.563485 | 0.535000 |
| Sum sq. resids | 5.43E+08 | 8.42E+08 | 5.09E+08 | 1.11E+09 |
| S.E. equation | 1731.345 | 2156.700 | 1676.909 | 2475.191 |
| F-statistic | 6.073859 | 1.598364 | 20.26375 | 18.16959 |
| Log likelihood | -1723.476 | -1766.314 | -1717.247 | -1793.173 |
| Akaike AIC | 17.82027 | 18.25963 | 17.75638 | 18.53511 |
| Schwarz SC | 18.05526 | 18.49462 | 17.99136 | 18.77009 |
| Mean dependent | -5.128205 | 83.07692 | 78.20513 | -6.410256 |
| S.D. dependent | 2004.177 | 2199.513 | 2538.106 | 3629.797 |
| Determinant resid covariance (dof adj.) | | 9.78E+25 | | |
| Determinant resid covariance | | 7.26E+25 | | |
| Log likelihood | | -6912.557 | | |
| Akaike information criterion (AIC) | | 71.51340 | | |
| Schwarz criterion | | 72.52048 | | |

*Source: Secondary data processed, 2020. T-table at 5% error level = 1.97196.*

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